UNITED STATES ARMY
SEPTEMBER 1973

AVIATION DIGEST

It Says, "For Helicopters Only," Clyde!

UNITED STATES ARMY AVIATION DIGEST

SEPTEMBER 1973 VOLUME 19 NUMBER 9

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ABOUT THE COVER

The ancient Egyptians probably never had to worry about "copter only" approaches—but Army aviators do . . . see "Hal's Helicopter Hieroglyphics" beginning on page 2

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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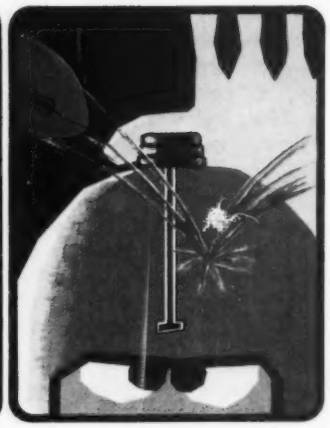
VIEWS FROM READERS



Sir:

The enclosed article was taken from the *Army Times*' edition of 2 May 1973 ["Flier Pay Plan Hurts Warrants"]. Up until now I have accepted, but have never understood, the Armed Forces adamant refusal to standardize flight pay between commissioned and warrant officers. Having at last recognized the insensitive inequity of the present system, the military has proposed an acceptable solution only to have it defeated in Congress. As the article so aptly asserts, I am not only "uptight" but dismayed that Congress would oppose such a proposal.

I am a warrant officer, rotary wing pilot in the U. S. Army. I have 10 years active military service, both as an enlisted man and as an officer. This amount of service under the existing Army regulations negates the possibility of my receiving a direct promotion to a commissioned rank and retiring with subsequent benefits. While I must remain a warrant officer, it is my preference to do so. I am, to borrow an Army phrase, the "true professional pilot." Also, as a warrant I am assured of an aviation career.

The Army groups its commissioned aviators by different classifications. Category "A" refers to those aviators currently serving in an aviation assignment. Category "B" refers to those aviators serving in a nonaviation assignment. For those on Category "B" assignments, flight pay may continue to be drawn monthly providing they have 1500 or more flight hours accrued prior to the beginning of such an assignment. This can continue for a number of years. If the same aviator has less than 1500 hours prior to the beginning of such an assignment, he must continue flight duties in order to draw his pay.

While warrants can themselves be utilized for Category "B" assignments, these assignments are few, and for the most part, a warrant officer can expect a career of aviation-oriented duties.

Without qualification, whether a commissioned or warrant officer, the duties of an Army aviator remain totally synonymous. It is for these duties alone that an aviator is given such an incentive pay. Unfortunately, the governing powers evidently feel that a captain's, major's or colonel's aviation duties differ considerably from those of a warrant. As an example, I am a command pilot in my unit and as such accept responsibility for the aircraft, crew and passengers. If I should, which I often do fly with a commissioned officer as a copilot, he is being awarded much larger incentive pay than myself while accepting none of the responsibility. Is this justice? If the military and/or Congress feel it that necessary to keep the flight pay one sided, would it not be reasonable to expect a commissioned pilot be in command on every flight while the duties of the warrant officer not exceed those of a copilot? No warrant officer would want this to happen, but neither would they desire to see the present system perpetuated.

More to have a feeling of having tried rather than remain apathetic, I would like to make the following suggestions. I feel that should serious consideration be given they would eventually save the military money.

• Terminate flight pay for those officers on Category "B" assignments. They should not expect to reap the benefits while executing unrelated duties.

• If there is a differential in flight pay then it should be based on time in flight status and not rank. Basic pay is the reward for higher rank and responsibilities of the commissioned officer.

• Completely reexamine the flight pay scale and correct present inadequacies existing. Flight pay could be similar to combat pay. Each man is paid $65 per month while in a combat zone. Flight pay should be paid for duties performed.

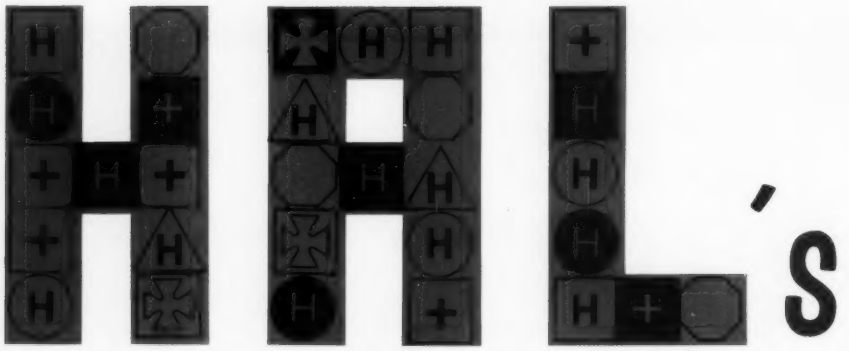
It is not my desire to deprecate the high integrity of the military. I am indeed appreciative that I have been allowed to select a career with such a purposeful and necessary organization. However, my own integrity dictates the necessity of asking that the present system be reevaluated and corrected.

CW2 William R. Yancey
1222 Logan
Lawton, OK 73501

• Because CW2 Yancey's thoughts no doubt echo the feelings of many of our Army aviators, it seems appropriate to provide DIGEST readers with official DOD policy regarding flight pay and set the record straight.

As early as World War II, Congress recognized that no amount of money would compensate an individual for undergoing the hazards involved in combat flying. Yet, it was universally understood that incentives were required to attract and retain highly skilled, trained personnel in certain hazardous professions; i.e., flying and

Continued on page 20



Helicopter Hieroglyphics

Warren H. Moore, DAC
Air Traffic Control Specialist
U. S. Army Aeronautical Services Office

In the past helicopter IFR recovery operations have relied on fixed wing instrument approach procedures—now as more and more "copter only" approaches emerge, the author who was chairman of the U. S. military committee that developed the copter only approach explains the charting standard

PRIOR TO THE introduction of the UH-1 and CH-47 in the early 1960s, relatively little helicopter instrument flying was conducted within Army aviation. Few aviators were helicopter IFR qualified and the basic helicopter was not properly equipped for productive IFR operations. Improved machines, better instruments, increased experience and updated training have contributed to reliable, safe operations. Because of this the Army is gaining an increasing amount of experience and expertise in helicopter IFR operations.

Qualified pilots, improved instruments, navigational aids and flying machines can be made available where needed. The associated training and educational program goals are aligned with the desired readiness posture of support for battlefield IFR conditions. Reliable mission support is possible when all the elements are put together.

In the past helicopter IFR recovery operations have depended on fixed wing instrument approach procedures that were designed under a criteria that catered to airplane instrument recovery needs. The criteria served both slow and fast aircraft alike for straight-in landings. Advantages were provided to slower aircraft in circling operations. The category system used to provide advantages for slow, smaller aircraft necessarily catered to the largest aircraft within each category. Helicopters were operated in the least restrictive category A parameter, yet were penalized by the needs of the fastest or heaviest aircraft in this category. Flying these procedures in helicopters resulted in extra distances, time and fuel expenditure. Protection from overruns by other faster aircraft would create ATC problems and disrupt flow control in terminal areas.

Helicopters operate at relative low air speed for instrument approach maneuvering and can safely approach at steeper angles and rates of descent than airplanes. Less visibility is required for landing due to the inherent ability to safely decelerate after visual contact with the surface is acquired. Flying fixed wing procedures into helicopter landing points under IFR is not acceptable for helicopters.

A criteria for helicopter instrument approach procedures has been developed under the chairmanship of the U. S. Army Aeronautical Services Office (USAASO) to cater to IFR needs. It will be applied by all the military services and the Federal Aviation Adminis-

tration (FAA) at locations where U. S. government elements exercise jurisdiction. Procedures may be developed for helicopter only operating bases and also at fixed wing airfields where separate helicopter procedures are needed. Fixed wing rules will be followed by helicopters as usual at locations not requiring separate helicopter procedures for separation of mixed traffic. For these the category A aircraft minimums will be used and the stated visibility will continue to be reduced by 50 percent.

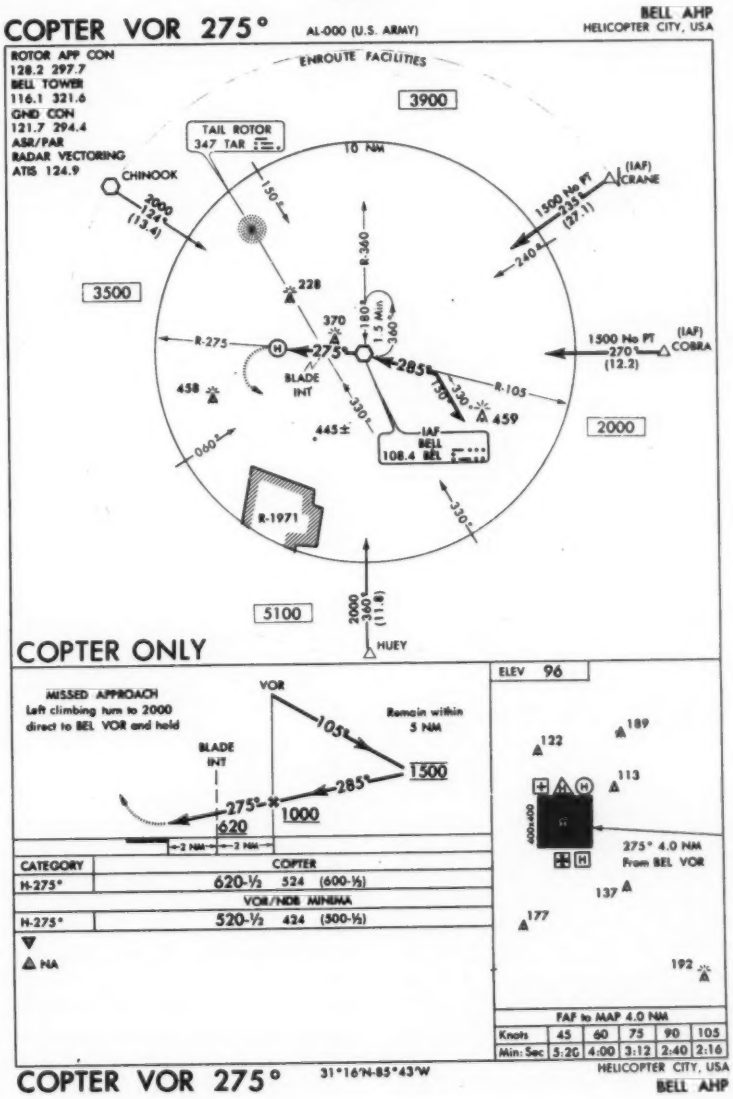
A U. S. government charting criteria has been developed for helicopter only approach procedures. Specific parameters of these criteria are provided in chapter 11, TM 11–2557–26 (TERPs) and are used in DOD charting of helicopter only procedures worldwide. Because of the detailed engineering involved, application must be relegated to well-trained procedural development specialist. The end result that is of primary concern to the aviator is the charted procedure. A survey of the prototype charts will provide a quick insight into the total system. Let's take the system apart, step by step, to see how it flies.

Helicopter approach procedure criteria ideally provides for an IFR approach to a landing area. When this is not possible or feasible due to obstructions or traffic conflicts, it is permissive to terminate the IFR approach at a safe altitude at a "point in space" and proceed visually to the site of intended landing.

In charting for these two type helicopter approaches it was desirable to maintain commonality with U. S. government procedural and charting standards to the maximum extent possible. Aviators, especially in the Army, are dual rated (helicopter and fixed wing). Redundancy in pilot training for differences in scale, legend and procedural philosophy was not acceptable. This and the impact on ATC rules and procedures would have resulted in a severe compromise of safety. Mixing of rules and procedures had to be avoided to eliminate potential cockpit confusion. The real crux begins to show.

The Bell Army Heliport (AHP) (figure 1) Copter VOR 275-degree approach chart is not much different from the basic U. S. fixed wing standard chart. A planview scale of 1:500,000 is used. The plan, profile and minimums areas are depicted in an identical manner. The circled H symbol for Bell AHP is common with U. S. and International Civil Aviation Organization chart legends. The alighting area symbols used in the aerodrome sketch area are new in charting. They represent common markings

Figure 1



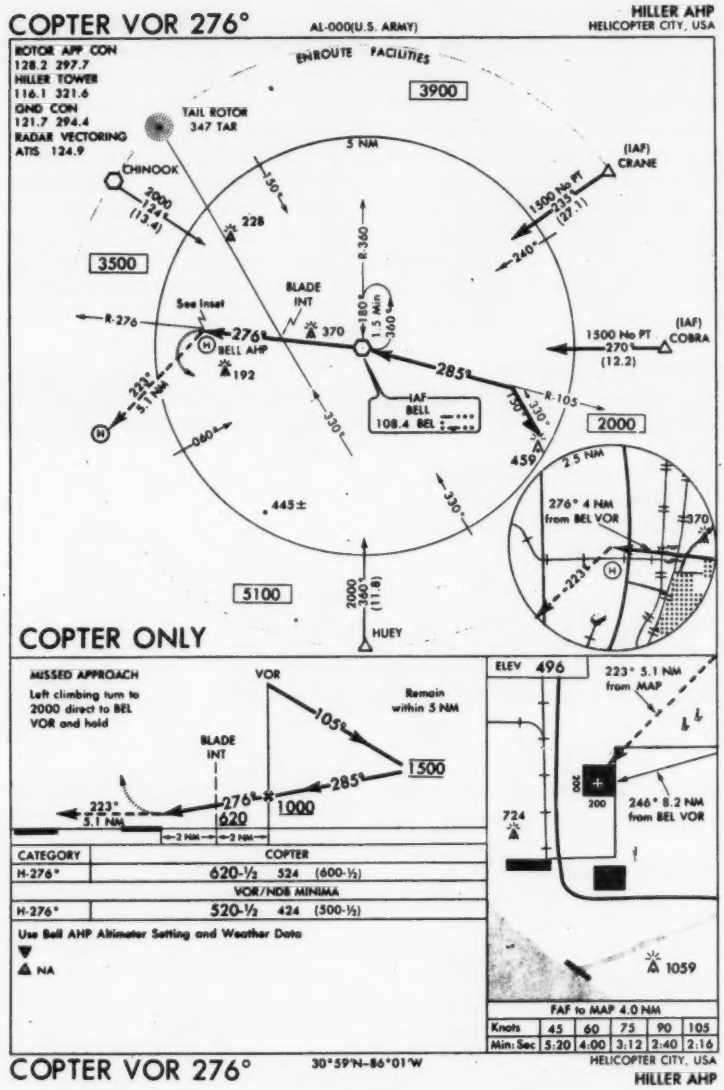


Figure 2

which may be found at heliports and on aerodromes worldwide. Such symbols will be depicted when known for each pad or landing area. If unknown the common circled H will be used. For this chart, the exact point of intended landing, after executing the VOR 275-degree procedure is depicted in the negative form to represent the markings painted on the landing pad. This innovation will eliminate any doubt as to where the helicopter will initially terminate the approach and contributes to exact pilot/controller understanding necessary for perfect air traffic control. This is especially important at heliports where a proliferation of pads and landing areas may exist.

The aerodrome sketch in figures 1 and 2 and the legend symbols in figure 3 tell it as it is. The formee cross used to identify the final approach fix in the planview of "TACAN only" procedures is being phased out of the symbol systems. This is to avoid confusion with the similar symbol used to mark helicopter alighting areas. The FAF symbol will continue to be used to mark the final approach fix in the profile on nonprecision procedures, both fixed and rotary wing. Confusion should not arise when used for this purpose. It was not considered prudent to remove the symbol which has a history of longtime use for this purpose.

The Hiller AHP (figure 2) Copter VOR 276-degree approach chart reflects an identical approach area. The final approach course is offset by 1 degree, to a point in space. This deliberate action sets the stage for basic understanding of point in space procedures by comparison.

The planview aspects are identical except that a scale of 1:250,000 is used. This scale will be used only when necessary to relieve chart clutter or better show the procedure. At this scale the area of coverage in the planview is reduced by 50 percent. This may result in the need for feeder rings (not shown) if they are required. At the point in space the aviator acquires ground contact and proceeds visually to the point of intended landing, provided VFR permits.

The secondary aerodrome/heliport (Bell) is shown by the common pad symbol in subdued lines (color). The visual track and distance to the primary heliport (Hiller) is provided. Approach minimums are related to the point in space and are not different from the 275-degree procedure to Bell AHP.

The point in space, also the missed approach point (MAP), is

noted and an associated inset is provided. This inset provides significant visual landmark features at and surrounding the point in space MAP, to assist in rapid orientation and decisionmaking prior to the visual operation which must follow. The inset scale may be varied as necessary for adequate coverage of geographic detail to assist in rapid orientation. The distance relationship will always be shown.

Because of relative slow helicopter approach speeds, the time and distance method of fixing the point in space is not precise. Lateral system error compounds this problem. The agency responsible for the procedure must consider such deviations in selecting the scale for the inset. Cartographic judgment also will influence the scale and amount of detail to be shown. When orientation at the MAP is acquired, the pilot is expected to proceed visually, using suitable visual charts, to the area of intended landing. Significant obstructions or hazards enroute, not otherwise charted, are found in the notes area of the chart.

The aerodrome/heliport sketch (figure 3) is drawn to show the landing area symbol in negative print. Significant visual landmark features at and surrounding the landing area are also provided to assist in orientation, traffic pattern entry and planning the landing approach.

Considerable efforts and study were expended in developing an original U. S. helicopter approach criteria and charting standard. It is expected that experience and use will result in identification of improvements which may be implemented. Flyable charts are available in the U. S. DOD FLIP. Fly the numbers, follow the rules . . . the pictures and symbols will tell it as it is.

AR 95–1 permits Army aviators to reduce visibility minimums by

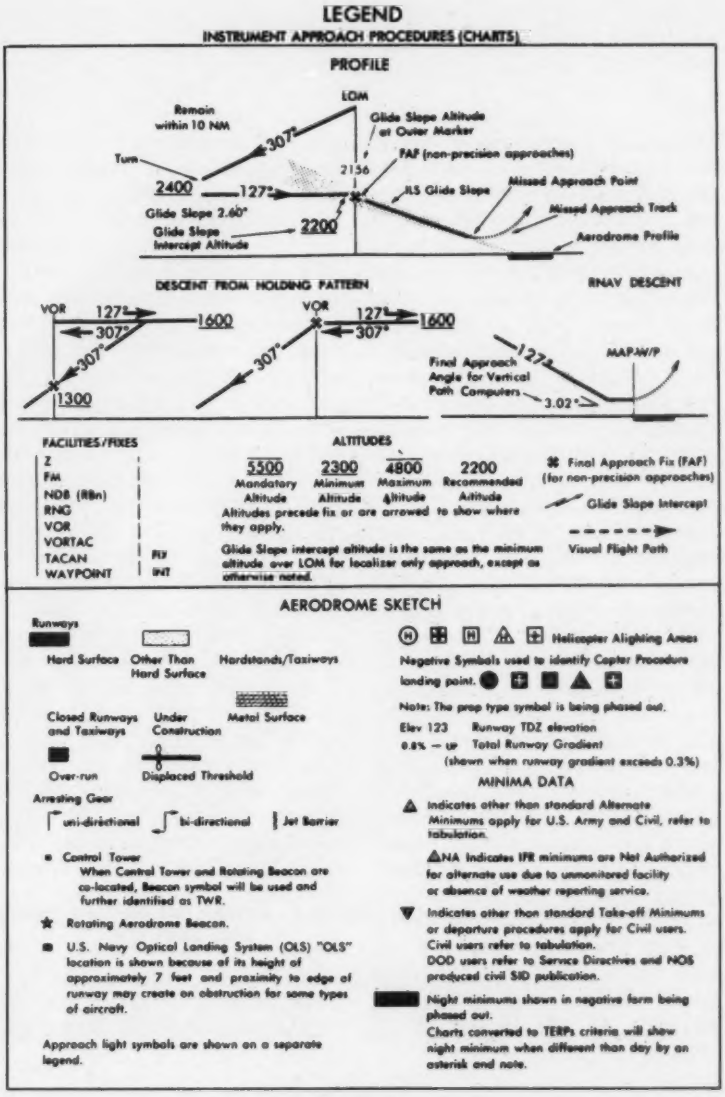

LEGEND
INSTRUMENT APPROACH PROCEDURES (CHARTS)
PROFILE
LOM
Remain within 10 NM
Glide Slope Altitude at Outer Marker
Turn
307°
FAF (non-precision approaches)
2136
2400
127°
ILS Glide Slope
Missed Approach Point
Glide Slope 2.60°
Missed Approach Track
Glide Slope Intercept Altitude
2200
Aerodrome Profile
DESCENT FROM HOLDING PATTERN
RNAV DESCENT
VOR
127°
307°
1600
1300
Final Approach Angle for Vertical Path Computers
3.02°
MAP-M/P
FACILITIES/FIXES
Z
FM
NDB (RBn)
RNG
VOR
VORTAC
TACAN
WAYPOINT
FIX
INT
ALTITUDES
5500 Mandatory Altitude
2300 Minimum Altitude
4800 Maximum Altitude
2200 Recommended Altitude
Altitudes precede fix or are arrowed to show where they apply.
Glide Slope intercept altitude is the same as the minimum altitude over LOM for localizer only approach, except as otherwise noted.
Final Approach Fix (FAF) (for non-precision approaches)
Glide Slope Intercept
Visual Flight Path
AERODROME SKETCH
Runways
Hard Surface
Other Than Hard Surface
Hardstands/Taxiways
Helicopter Alighting Areas
Negative Symbols used to identify Copter Procedure landing point.
Closed Runways and Taxiways
Under Construction
Metal Surface
Note: The prop type symbol is being phased out.
Elev 123 Runway TDZ elevation
0.8% — up Total Runway Gradient
(shown when runway gradient exceeds 0.3%)
Over-run
Displaced Threshold
MINIMA DATA
Arresting Gear
uni-directional
bi-directional
Jet Barrier
Indicates other than standard Alternate Minimums apply for U.S. Army and Civil, refer to tabulation.
Control Tower
When Control Tower and Rotating Beacon are co-located, Beacon symbol will be used and further identified as TWR.
NA Indicates IFR minimums are Not Authorized for alternate use due to unmonitored facility or absence of weather reporting service.
Rotating Aerodrome Beacon.
Indicates other than standard Take-off Minimums or departure procedures apply for Civil users. Civil users refer to tabulation.
DOD users refer to Service Directives and NOS produced civil SID publication.
U.S. Navy Optical Landing System (OLS) "OLS" location is shown because of its height of approximately 7 feet and proximity to edge of runway may create an obstruction for some types of aircraft.
Night minimums shown in negative form being phased out.
Charts converted to TERPs criteria will show night minimum when different than day by an asterisk and note.
Approach light symbols are shown on a separate legend.

Figure 3

50 percent. This will be continued for fixed wing procedures operating under category A minimums but not permitted for procedures having the word "COPTER" in the procedure title. Visibility for these will be published for simplicity and easement in operations.

Long range goals involve acceptance of this system concept by foreign national aviation authorities. This would result in a common standard wherever we fly. Improved equipment, training, criteria, charts and standardization would result in improved safety and mission accomplishment worldwide.

Don't copout in helicopter cloud collision conditions. A haven for happy hover at home helipad is here when you hark and heed helicopter hieroglyphics.

an interview with Captain Charles F. Nowlin, full-fledged member of the Krispy Kritter Klub, who says it's

"JUST PURE HELL"

COLONEL FRANCIS MAX McCULLAR, COMMANDER, U. S. ARMY AGENCY FOR AVIATION SAFETY: *I selected Captain Charles F. Nowlin for interview because of his personal experience with thermal injuries which resulted from an aircraft accident in the Republic of Vietnam. Because of his injuries and those of others with whom he became closely associated, Captain Nowlin began an independent study in the proper use of personal equipment. During his 2-year confinement in the Brooke General Hospital at Fort Sam Houston, TX, Captain Nowlin, in conjunction with the Institute of Surgical Research, formulated a safety program on life support equipment, which he is now presenting throughout the Army. I feel that all commanders and aviators can learn something from Captain Nowlin's professional approach to personal safety.*

McCULLAR: Captain Nowlin, you were at Fort Rucker recently for an in-flight evaluation and now you're here again to make a film of your experiences. Before we get into the more formal part of the interview, tell us about your present assignment.

NOWLIN: I'm assigned to Operations with the 507th Medical Company (Air Ambulance) at Fort Sam Houston, TX. This is the grandfather unit of the Military

Assistance to Safety and Traffic (MAST) Program. Basically, this program provides military helicopters, pilots and medics when aid is requested during civilian medical emergencies. It is doing an outstanding job of saving lives and transferring patients, more than a thousand to date, from one hospital to another in the San Antonio area.

McCULLAR: Was there another reason you were assigned to Fort Sam Houston?

NOWLIN: Yes, sir. Basically, to continue my reconstructive plastic surgery, which will take a couple more years, and because of the availability of Colonel Hugh D. Peterson, the extraordinary Chief of Plastic Surgery at the Brooke General Hospital.

McCULLAR: USAAAVS will use the film of your experiences in its instruction at Fort Rucker and on the road and we hope to make it available to all who might request it. So that our readers will have an idea of what the film is about, would you tell us your story?

NOWLIN: Initially, I was assigned as a section leader to the 101st Airborne Division with Bravo Company of the 158th Assault Helicopter Company in Vietnam. Then I transferred to Camp Eagle where I was assigned as operations officer and lead scout of the 1st Brigade Aero Scouts of the 101st.

One evening in December 1970, Fire Base Birmingham began receiving mortar rounds and my scout section was alerted that assistance was needed immediately. We prepared to launch, but it was cancelled because of nightfall. The launch was then laid on for a first light mission the next day. I was flying low bird on the white team mission. We rendezvoused at Birmingham with the command and control ship and moved down to the first ridgeline south of the fire base. Passing over the ridgeline, we saw fresh earthen works and began a 180-degree turn to take a better look. At this time the engine went out on my OH-6, which was not equipped with a crashworthy fuel system, and I had but one alternative—to get as far away from the area as possible. I pulled in maximum power and made two calls, practically screaming that my engine was out to let my gunner and the people who were covering me know what was going on. I shot an approach to the only open area, a small bomb crater halfway down the mountain. Just prior to impact, I ran out of power and the aircraft began to turn rapidly. On impact I was knocked unconscious and my gunner was thrown free of the aircraft. He was strapped in the aircraft with a 5,000-pound-tested "monkey harness" which he was wearing beneath his chicken plate. The harness snapped, cutting and bruising him across the stomach and chest. Being in a state of shock, he turned around and saw that the aircraft was engulfed in flames and that I was slumped over the cyclic, apparently dead. He left the area and was later picked up.

As I began to regain consciousness, I sensed a feeling of warmth, but didn't realize what was happening. So I did what all of us did in Vietnam when we got hot—I unstrapped my helmet, but with great difficulty. It was at this time I realized something was wrong with my right hand. I finally got the helmet off and noticed that it was shattered on the upper right side. Part of the helmet was missing where shrapnel, AK fire or part of the main rotor had come through the canopy and hit me on the right side of my forehead. The helmet

Continued on page 40

Captain Charles F. Nowlin, a 1967 graduate of the Texas Lutheran College, taught school in San Antonio, TX, for one year before entering the Army in June 1968. He received his basic training at Fort Knox, KY, went through Advanced Infantry Training at Fort Polk, LA, and graduated from OCS at Fort Benning, GA. He served as training officer at Fort Polk before entering flight school in September 1969. In June 1970 he was graduated from flight school at Fort Rucker, AL, and was assigned to the 158th Assault Helicopter Company, 101st Airborne Division, Vietnam, in August 1970. Then in October he transferred to the 1st Brigade Scouts of the 101st. On 19 December 1970 Captain Nowlin's OH-6 helicopter was downed by enemy fire and burned, and he sustained third-degree burns to 35 percent of his body. He was evacuated to Phu Bai, then to Camp Zama, Japan, and finally to Brooke General Hospital, Fort Sam Houston, TX, in January 1971 where he underwent almost two years of plastic surgery. Presently, he is assigned to the 507th Medical Company (Air Ambulance) at Fort Sam Houston and is continuing to undergo plastic surgery.

SIZZLERS

The latest in "liberated" men's underfashions have even infiltrated the formality and utility of military uniforms

. . . RED HOT

. . . COLORFUL

. . . FLASHY

. . . CRISP, IGNITING PATTERNS . . .

BOLD STRIPES

. . . BODY CONTOURED . . .

SMOOTH FITTING

SNUGLY TAILORED

SIDE VENTS

BRIGHT PASTELS

100% Nylon Acetate

THE LATEST IN men's fashionable underpinnings may be stylish and contemporary, but it also is potentially hazardous to an air crewman's health. Nylon and other synthetic fabrics should *never* be worn when Nomex or fire-retardant garments are indicated by hazardous work conditions. As stated in a previous "Pearl's" article (Nov 72), nylon and similar artificial fibers melt at about 300 to 400 degrees F.

Nomex will protect against flame and delay heat transfer, but sufficient exposure soon raises the skin side temperature to 300 to 400 degrees F. Artificial fiber garments then start melting and severe burns result as the molten material sticks to the skin [due to more efficient

Aeromedic

LTC Nicholas E. Barreca, M.D.

Provided by the Society of U. S. Army Flight Surgeons

heat transfer by conduction]. Meanwhile, the Nomex remains relatively undamaged and functional up to its rated temperature of about 900 degrees F., at which point it will char.

The only acceptable and expeditious alternative is the use of 100 percent cotton or 50 percent cotton/50 percent wool undergarments. During the summer "longjohns" are somewhat warm for even the best motivated safety proponent. A wise and thrifty solution can be readily obtained at quartermaster clothing sales stores. The 100 percent cotton undershirt and boxer style drawers provide an extra layer of insulation under the standard Nomex uniform. Cotton briefs also are available but these are snug fitting and thus less efficient insulators. (They also predispose to various groin rashes in some individuals.)

For winter wear the U. S. Army Aeromedical Research Laboratory has demonstrated that standard ankle length underwear (50 percent wool/50 percent cotton) is as flame-retardant as Nomex underwear when worn under the Nomex flight suit. These have been designated for air crewmember use and are available through normal supply channels.

There is no excuse then! Save the fashionable undergarments for those who will appreciate them when attending to air crewmember duties. Your instructor pilot, copilot, fellow crewmen and associates at the health club or gym could care less about your boudoir idiosyncrasies.

Proper wear of the fire-retardant flight suit: Recently a multiagency aeromedical cooperative effort resulted in The Surgeon General of the Army stating his official position on this matter. *The recommendation is aimed at maximizing protection of air crews engaged in aircraft runup or actual flight operations.* It should not be misinterpreted to represent a guide for uniform wear and appearance policies under other conditions. These are determined by Army regulations and commander prerogatives.

The recommended wear of the Nomex flight suit to maximize safety and optimize protection is:

· Keep the shirt tucked deeply in the trousers. Keep the belt properly fitted to preclude the shirt from slipping out of the trousers.

· Keep shirt sleeves rolled down and tightly closed by the Velcro tabs. Shirt sleeves should be long enough to fasten securely over the outside of the cuff of the glove and not slip over the cuff and onto the forearm during maximum extension or range of motion of the hand and arm.

· Keep the shirt zipper closed, all the way up, and covered by the overlapping Nomex panel to preclude flames tunneling in to contact body surfaces.

· For maximum protection wear the shirt collar up and snugly closed at the front of the neck by securing the Velcro tab provided.

· Keep the trouser fly securely closed (zipped or buttoned) and covered by the overlapping Nomex panel, again to preclude tunneling of flames through openings in the uniform to contact the body surface.

· Keep the trouser legs secured tightly by the Velcro tabs over the upper half of the shank of the leather boot. Trouser legs should be long enough to cover the upper half of the leather boot with the leg maximally flexed or involved in maximum range of motion activities. Under no conditions should the trouser leg be so short as to ride up over the boots and onto the calf.

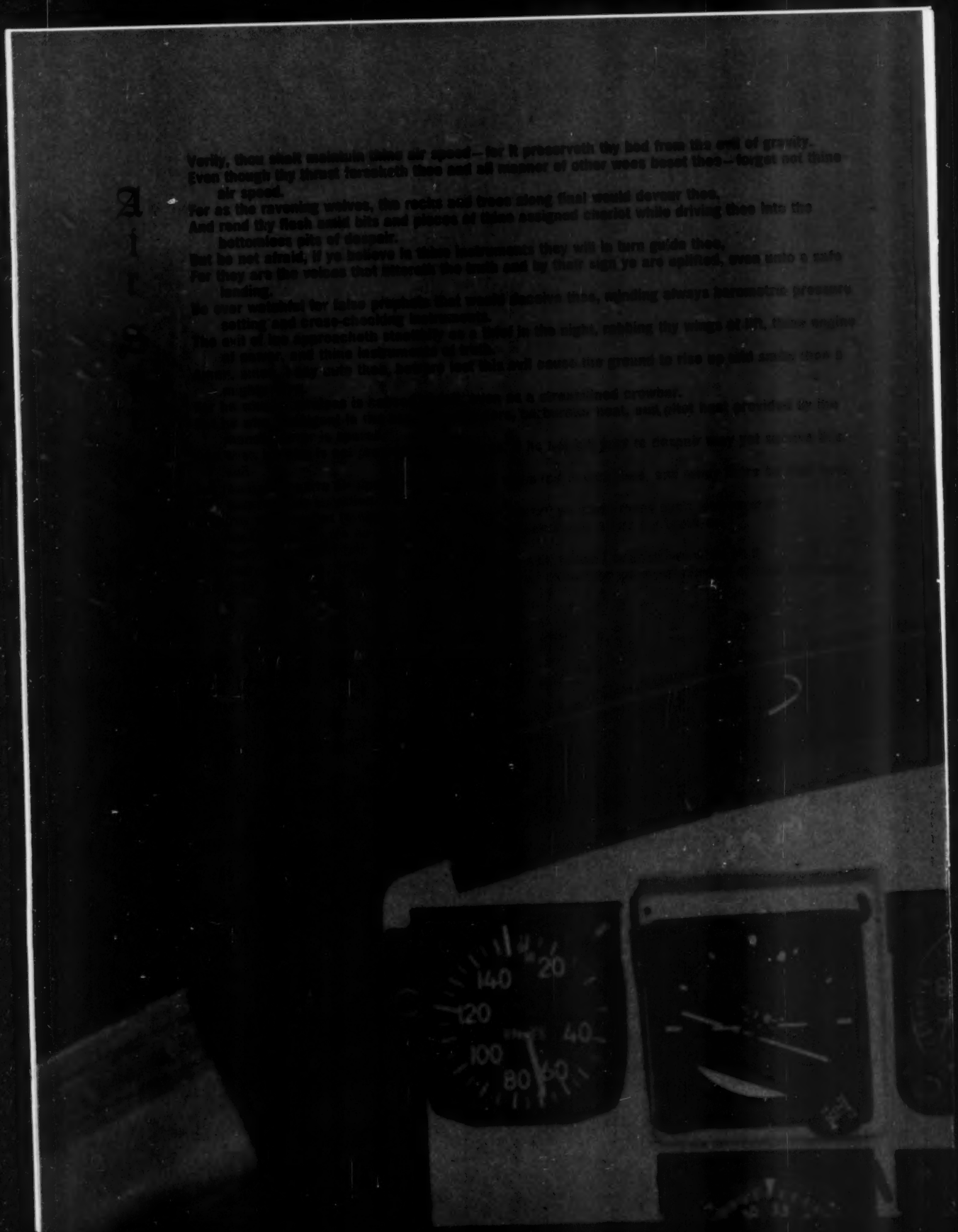
· Pockets should be closed, using buttons or zippers, and covered by the Nomex flaps provided. Collar and shirt insignia and patches should be cotton cloth, not metal.

· The responsibility for enforcing the proper wearing of the fire-retardant flight suit during possible exposure situations lies with the unit commander and, additionally, is the charge of the individual while at risk. The uniform must be properly worn at all times when exposure is a possibility. Seldom will there be an opportunity to properly adjust the uniform after an emergency situation has been identified.

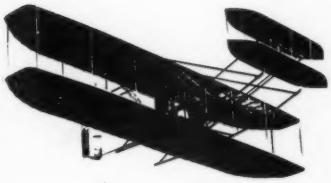
· In general, the flight suit should be worn loose to provide a layer of air as insulation against heat transfer. It should not be tailored or procured in sizes that approximate a tight fit. Undergarments should be of cotton or wool fabric, never nylon or other hazardous materials.

These recommendations will ensure that the maximum possible body surface is covered and that adequate insulation is provided to effect both fire retardancy and reduction in heat energy transfer.

"YOU TOO can become a Krispy Kritter . . . if you don't wear your Nomex properly"


Verily, thou shalt maintain thine air speed—for it preserveth thy bod from the evil of gravity.
Even though thy throat forsaketh thee and all manner of other woes beset thee—forget not thine air speed.
For as the ravening wolves, the rocks and trees along final would devour thee.
And rend thy flesh amid bits and pieces of thine assigned chariot while driving thee into the bottomless pits of despair.
But be not afraid, if ye believe in thine instruments they will in turn guide thee.
For they are the voices out thereto the mark and by their sight ye are spirited, even unto a safe landing.
Be ever watchful for false prophets that would deceive thee, minding always barometric pressure setting and cross-checking instruments.
The exit of the approacheth steadily on a beat in the night, nibbling thy wings at rpm, thine engine of power, and thine instruments of guide.
Forget not thy safe task, perhaps just this put cause the ground to rise up and smite thee a mighty smite.
Thou shalt not attempt to [illegible] as a streamlined crowber.
Thou shalt not covet thy neighbor's [illegible] nor his [illegible] nor his [illegible] nor his

Airplane . . .



In the beginning there was airplane.
And Wilbur looked upon it and saw that it was uncertificated and devoid of pilot.
So, looking upon Orville, he caused a coin to be flipped, and, lo, Orville became pilot.
And in those days man knew not of FAR, so mounting airplane, Orville caused it to fly, even without checklist or seat belt,
Seeing these things caused the heart of Wilbur to be gladdened, and he sang a joyous song unto reporters.
And the reporters departed the land of Kitty Hawk in great haste, for unto them this day had been given the golden key.
Was not one airplane flight (or crash) worth more than many train wrecks?

Nav/Com . . .

Forsake not thy NAV/COM for thy VHF and the VOR they guide thee,
Providing thee with solace during times of strife, yea, even unto removing mountains from thy flight path.
Even though thine engine should fail thee and thy rotten luck should cause thee to "bend the skin"—forget not thy radio.
For thy controller is a loving and patient father to those calling upon him in the name of Mayday
And many have gained salvation thereby.
But beware, for his wrath is mighty upon those who use 121.5 in vain,
And such transgressors shall be made to tremble, sore afraid, before the seat of the examiner.
Be ever brief in thy communications, using always the proper phraseology and phonetic alphabet.
For thy controller is oft times busy, and, but for his loving patience would consign the "gabber" to the nearest mountaintop.
And of "mumblers," "shouters," "dial twisters," and "mutes" he is sorely tempted to consign to the bottomless pits of hell.
Be always on good terms with thy avionics repairman, for is it not better to be reminded of his skill at beer call than during an ILS approach?

SP5 John D. Hays Jr. is an operations specialist with the Alabama Army National Guard. With 4,000-plus flight hours, he holds an FAA commercial pilot's license and is a certified flight instructor. He has served as a production test pilot for North American Rockwell and an aircraft flight manual writer for Lockheed Aircraft for the C-130, C-140 and C-5A Galaxy

Pinnacle Operations

Flight Lieutenant Brian A. Wright
Royal Air Force

The author discusses the flight techniques developed by the Central Flying School of the Royal Air Force at its mountain flying school in North Wales

TO EVEN THE most experienced helicopter pilot mountain flying presents a formidable challenge. The unpredictable turbulence, weather and inhospitable terrain all combine to increase the adrenalin in all but the most stoic aviator. But an aviator can safely plan and fly an approach to a pinnacle or ridgeline. Here are the techniques developed by the Central Flying School of the Royal Air Force at its mountain flying school in North Wales.

The first step in any approach is a thorough and careful reconnaissance of the site. The most important part of the reconnaissance is to establish the wind direction. If this is not clearly evident from natural features or the nature of the turbulence, there are three techniques which can be used to find the wind direction—the groundspeed/airspeed comparison, the cloverleaf and the pinnacle orbit.

The groundspeed/airspeed comparison (figure 1) is the most suitable to employ on a ridgeline and

Flight Lieutenant Wright is an exchange flight instructor from the Royal Air Force and currently is assigned to the U. S. Army Aviation School at Ft. Rucker, AL

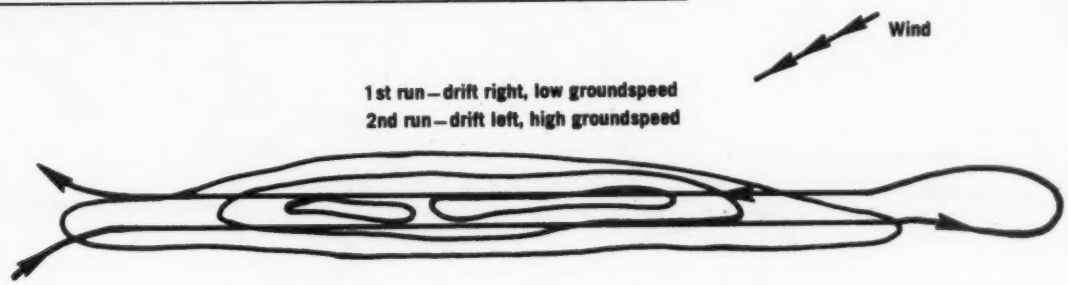


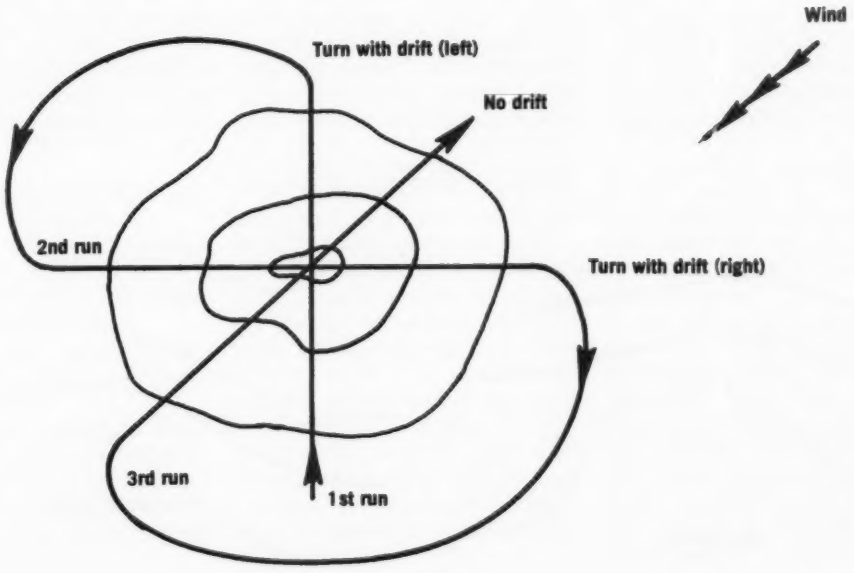
Figure 1: Groundspeed/airspeed comparison

the helicopter is flown along the ridge at a constant airspeed, around 60 knots. The drift and apparent groundspeed are noted and the helicopter is then flown on the reciprocal of the first heading. The drift and groundspeed are again noted and when compared to the first run will enable the wind direction to be established.

The cloverleaf (figure 2) is best suited when the landing site is fairly large. The aircraft is flown over the site on a cardinal heading, in trim and at about 60 knots. The drift is noted and the helicopter is turned with the drift and flown over the feature again on a heading 90 degrees from the first. The drift is again noted and, if any doubt still exists about the wind direction, the process can be repeated until the helicopter is flown over the feature and no drift is apparent. This is then the into-wind heading.

The pinnacle orbit (figure 3) can be used on a sharply pointed feature when the landing area is not large enough to give a reliable indication of drift. The helicopter

Figure 2: Cloverleaf



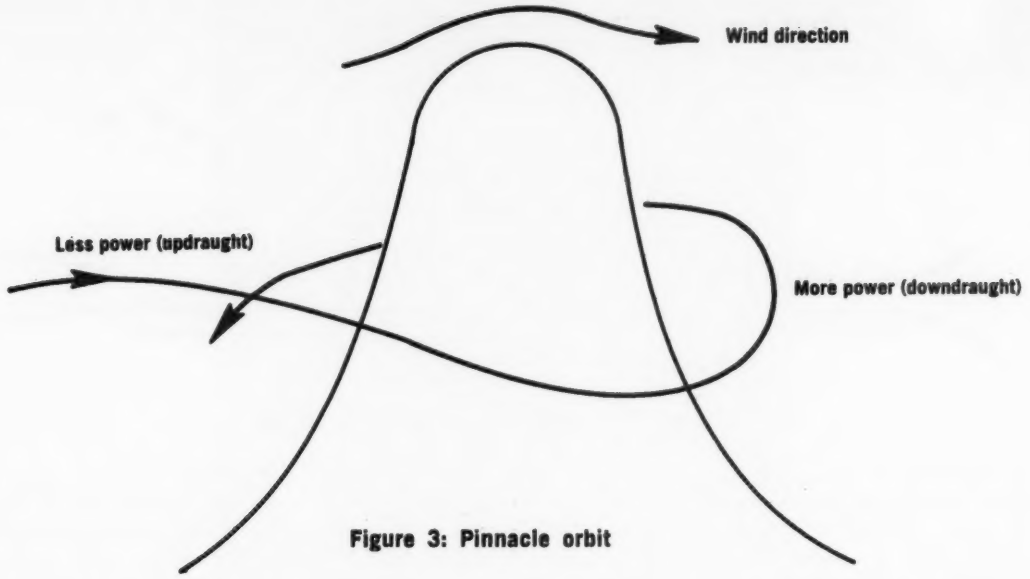


Figure 3: Pinnacle orbit

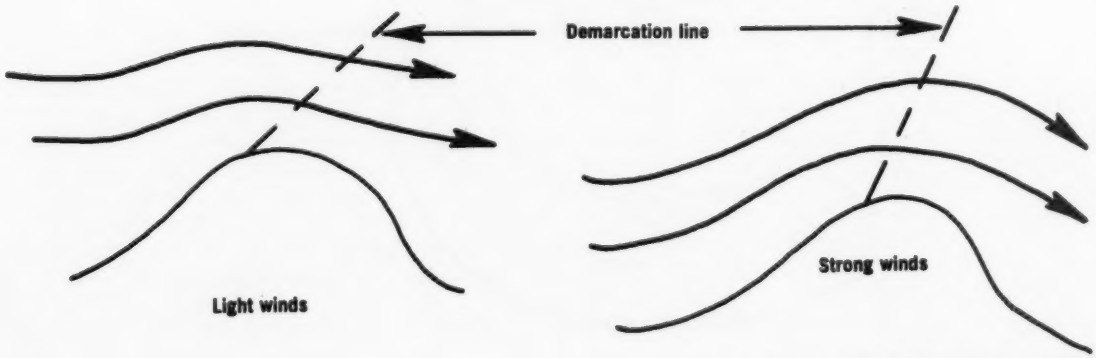
is flown around the pinnacle, below the summit, at a constant altitude and airspeed. The changes in power necessary to maintain altitude will indicate the updraughting and downdraughting air and so reveal the wind direction.

Once the wind direction is established the landing site should be carefully examined while flying level past the intended point of touchdown. The height of the landing point as indicated on the altimeter should be noted. The pilot should then turn downwind and climb high enough above the landing point in order to start his approach. This should normally be in the region of 200 to 300 feet. But in mountainous regions the presence of other peaks or ridges often necessitates a short final approach leg and the pilot may need to climb only 50 to 100 feet above the landing point to establish himself on a normal approach path. On turning final it will appear to the pilot that he is below the landing point but a glance at the altimeter will quickly reassure him.

The steepness of the approach will depend upon the strength of the wind and the manner it flows over the pinnacle. The diagrams in figure 4 show how the flow over a pinnacle varies according to wind strength.

In each case there is a line called the demarcation line which divides the up- and downdraughting air. The approach must be on or above this line and will be steeper in strong winds than in light wind conditions. Many pilots tend to fly steep approaches in even light wind

Figure 4: Wind over pinnacle



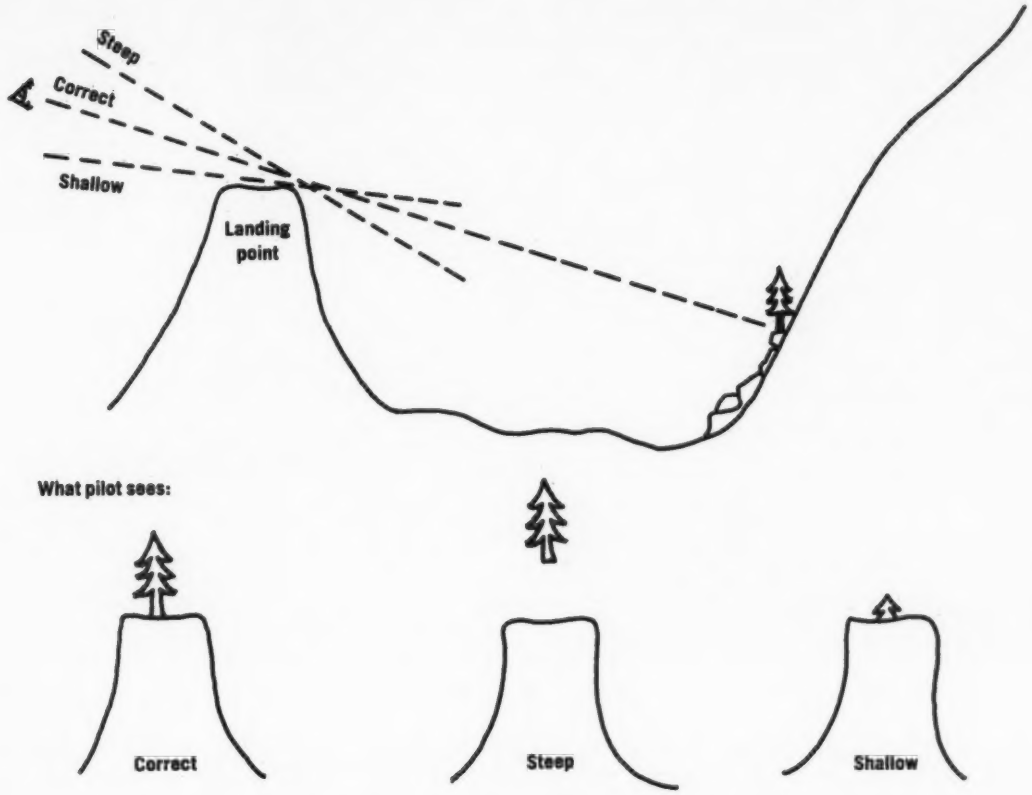


Figure 5: Constant angle approach sight picture

conditions. This is not only unnecessary but also potentially dangerous because there are hazards inherent in steep approaches compared to using a more shallow approach path:

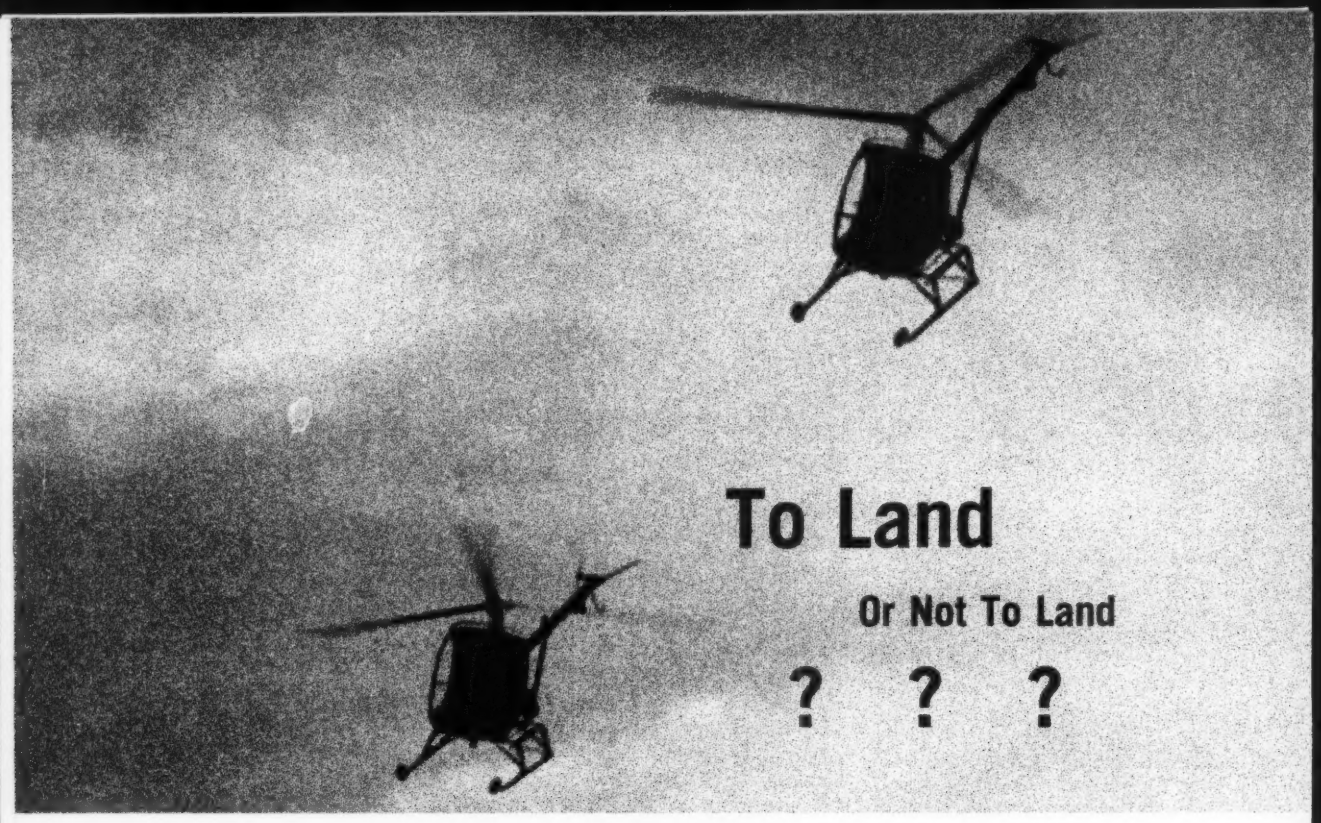
- A steep approach needs more power to hold the angle.
- The rate of descent is generally higher.
- Translational lift is lost earlier on a steep approach.
- There is more danger of entering a settling with power condition.
- More pitch means that rotor rpm decay will be more rapid in the event of an engine failure.
- In most helicopters visibility of the landing point is poor during a steep approach.

Once the helicopter is started down the selected approach path, it is important to maintain the angle as undershooting can have dire consequences. A technique can be used to maintain a constant angle which involves using a feature behind the pinnacle and should be easily understood from the diagrams in figure 5.

The touchdown should be on the upwind part of the landing site in the updraughting air. If the pinnacle is small it is necessary to select a lateral marker on short final to assist in landing the aircraft on the required point. This is because the pilot will not have a ground reference in front of him when he reaches the upwind edge of the pinnacle.

The takeoff from a pinnacle is an *altitude-over-airspeed* takeoff where airspeed is gained at the expense of altitude. The only point here is to ensure that the helicopter is flown off the pinnacle and not dragged over the edge. The danger in dragging the helicopter off the pinnacle is that the helicopter may drop and the tail strike the edge of the pinnacle.

Any pilot who is familiar with mountain operations already will be aware of most of the points mentioned above. For those with no mountain flying experience, perhaps you will recall this article one day when you find yourself up there at 10,000 feet with the adrenalin surging through your veins. Good luck!



To Land Or Not To Land ? ? ?

WOI Wayne H. Silk

ON A LATE January 1973 afternoon I completed the preflight of my TH–55A in preparation for my first solo cross-country flight from Wrangler Stagefield to the main heliport at Ft. Wolters, TX.

The three-leg flight was going well until a point 8 miles east of my last fix to Ft. Wolters. Then I noticed my oil pressure gauge fluctuating. At this time I went from cruise power at 2700 to normal power of 2900 rpm and notified the controller at Wrangler Stagefield of my situation. He directed an aircraft which was ahead of me to make a 180 and take up a trail position on my aircraft.

Control also asked me about my other engine indications, i.e., oil temperature and cylinder head temperature. I replied that they were in normal range and that I would keep them informed. I was advised to continue on course.

All this time I had been flying over the most suitable areas for a forced landing. Then those areas disappeared and about 1 minute later I had a loss of power which I was unsuccessful in regaining. Seconds later complete engine failure occurred.

I transmitted a Mayday while entering autorotation, making a 90-degree turn to a small confined opening. During the descent a multitude of thoughts raced through my mind, one of which was the prospect of going into the mesquite trees which were all around me. Keeping this lone small open spot in front of me, I found myself maneuvering the aircraft to avoid the surrounding obstacles. Due to earlier heavy rains in the Texas area I had to flare my aircraft down to zero air speed over my selected touchdown point . . . no ground run. Initial pitchpull and full pitchpull was completed and the aircraft was on the ground safely, without damage.

The only injury I sustained was to my pride, for I knew I should have landed earlier when I first experienced the oil pressure fluctuation and had the better choice of forced landing areas.

I can only say that when you have a problem in flying remember you are in command of the aircraft; you're responsible, not the controlling agency. When in doubt don't stick your neck out—put it on the ground safely—you'll be glad you did.

The author is a member of the Pennsylvania Army National Guard and recently completed the Initial Entry Rotary Wing Aviator Course at the U. S. Army Aviation School, Ft. Rucker, AL

EGT vs OAT

. . . and the turbine engine

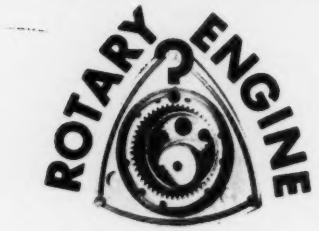
CW2 Jan E. Lindbak

ON OCCASION I have seen memos and information letters published in regard to damage found internally on turbine engines. Contractor and maintenance managers claim that these engines could only have been damaged due to an overtemped condition (hot starts, etc.) caused by unprofessional attitudes and inattention by pilots. However, in flying several UH–1 aircraft I have noticed that exhaust gas temperature (EGT) gauges are not properly calibrated, which very likely is the direct result of overtemp damages found on engine inspections.

Part of the pilot's preflight inspection is to check instruments and gauges for proper static readings but, unfortunately, most pilots are not aware that the outside air temperature (OAT) gauge and EGT gauge should read approximately the same temperature in static position. For example: If your OAT gauge reads 40 degrees C., your EGT gauge should read approximately 40 degrees C. or two tick marks or even a little more, since the EGT probes are located in the tailpipe and heat reflected from the sun has a tendency to increase temperature in this area.

T6 engine health program is of course a great help in combating the tremendous monetary expenses resulting from internally damaged engines, but any program such as this is only as good as the pilots make it and the maintenance personnel allow it to be. These EGT gauges can be made to read anything that the maintenance man wants them to read. So it is possible since a proper calibration of the EGT system requires several readings along the entire scale that these gauges are calibrated to indicate properly only along those parameters set up for the engine health readings. So, pilots, take heed and let us help the maintenance man stay *honest*—and *yourself alive*—and reduce this unnecessary internal damage problem to turbine engines by noting the static readings on the OAT and EGT gauges.

ROTARY WING!



Ronald DeSplinter, DAC
Aerospace Engineer
U. S. Army Aviation Systems Command

Is the Wankel rotary engine the rotary wing engine of the future? Several events have occurred in the past year providing a tremendous amount of publicity for the Wankel rotary engine. This engine has received both acclaim and criticism throughout the world

THE JAPANESE are manufacturing and selling Wankel powered automobiles, namely, the Mazda RX2, and the Germans are doing likewise with the NSU R1–80. General Motors has programed a $50,000,000 investment with NSU-Wankel and Curtiss-Wright for worldwide nonexclusive rights to manufacture and sell rotary engines without royalties excluding aircraft engines.

NSU-Wankel is the German patent holder and Curtiss-Wright has exclusive rights for manufacture and sales in North America. Ford and American Motors have also negotiated a limited agreement. Several leading U. S. magazines and newspapers have published articles about the Wankel rotary engine. Manufacturers are using rotary engines to power lawnmowers, snowmobiles, outboard marine engines and motorcycles.

Let's take a closer look at this engine . . . beginning with its history. The inventor is a German-born engineer, Dr. Felix Wankel. In the 1920s Dr. Wankel created and organized his engine theories. World War II interrupted his work; however, subsequent to the war he acquired his own workshop and received a research and development contract with NSU Motor Works of Germany. In 1957 a model was completed and a year later a working model was developed. By 1959 endurance tests were being run at NSU and the rotary engine concept was confirmed as a viable power plant.

During the 1960s several manufacturers rejected the Wankel because of the high risks in the areas of tooling costs and durability. Now due to the courage of a few manufacturers, operational experience coupled with design refinements have produced a contender in the engine industry.

In reviewing the physical characteristics and operational theory of the engine, figure 1 shows a general view of the engine with a cutaway of the internal dynamic parts.

Figure 1

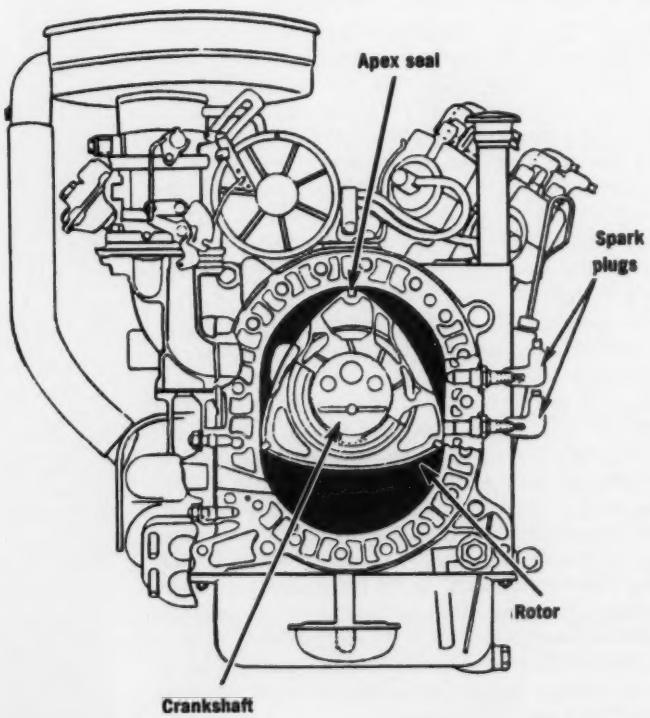


Figure 2 shows the four steps required to complete the otto cycle with one revolution of the rotor inside the epitrochoid (fat figure light) chamber. Note that two additional otto cycles are in progress simultaneously to accommodate all three sides of the triangular rotor. Engine power is regulated by thickness and number of rotors. Engine durability is dependent on rotor seal wear and rotor chatter marks on the internal chamber surfaces. Tooling costs are dependent on the method used to machine the epitrochoid surfaces and the rotor seal slots. Engine reliability and maintainability expectations are proving through operational experience to be an asset.

Consider the compatibility and the use this power plant may have in a helicopter:

Advantages

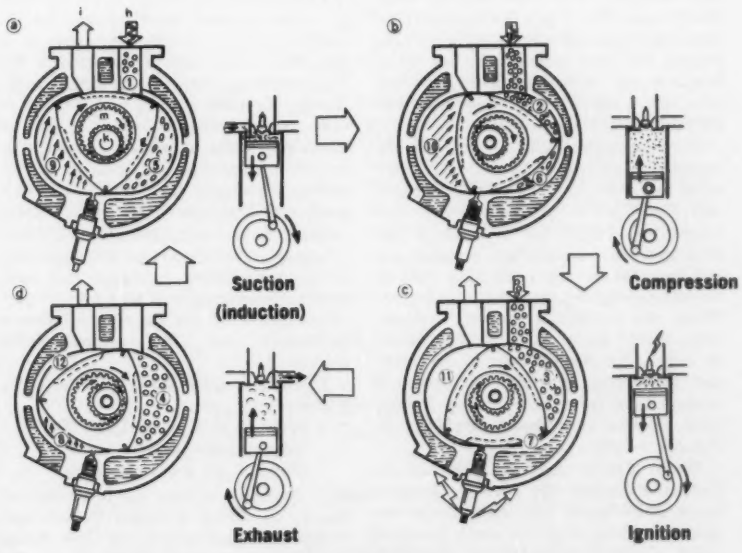
- Less vibration
- Better pollution control
- HP/LB is greater than reciprocating engine
- Less parts
- Reduced overhaul costs
- Lower fuel consumption than turbine engine
- Reduction in fatigue problems caused by reciprocating engine frequencies
- Low octane fuel
- Ease of starting
- Small stress levels
- Simplicity

Disadvantages

- Lack of use experience
- HP/LB is less than turbine engines
- Higher fuel consumption than reciprocating engine
- High production costs for new items

The helicopter is a very dynamic machine with a multitude of frequency responses emitted from rotors, gearboxes, power plant and accessories. The introduction of the Wankel engine as a power source can reduce the magnitude of forces experienced in helicopters with the hopeful outcome of providing the helicopter with a more compatible power source. The U. S. Army is making this effort through a feasibility model of a Curtiss-Wright Wankel powered Hughes TH–55A light observation helicopter. The official first flight occurred on 15 March 1973 at Culver City, CA. A flyable hardware model will be used for demonstration purposes this year. The demonstrator will exhibit performance, fuel and oil usage, maintenance requirements, human factors and safety. Acceptance of this type of engine as a competitive power source in helicopters will depend on future military mission requirements and commercial requirements. These requirements will create the demand and provide the finances.

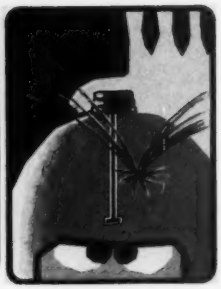
Mr. DeSplinter, a Department of the Army civilian, in addition to possessing the degree in Aerospace Engineering has an Airframe and Power Plants license. He is currently assigned to AVSCOM's Directorate of Research/ Development and Engineering


h – Intake manifold
i – Exhaust manifold
m-k – Output drive gears
1 - 4 Suction (induction) 5 - 7 Compression
8 - 10 Ignition (Power) 11 - 12 Exhaust
a → b → c → d → a
Suction (induction)
Compression
Exhaust
Ignition

Comparison of Wankel system with a four stroke engine

Figure 2

VIEWS FROM READERS



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submarine duty. Thus, the concept of flight pay as incentive pay emerged which established a ratio of flight pay as one-half of an individual's base pay.

Section 301(b), Title 37, United States Code, prescribes the rates of crewmember flight pay for commissioned officers and warrant officers. The rates and structure were revised by the Career Incentive Act of 1955 which continued a ratio of incentive pay (flight pay) to basic pay. Accordingly, incentive pay varies between grades as well as within grades based upon years of service. The rationale is that the direct relationship of incentive pay to basic pay offers a greater incentive for retaining qualified crewmembers in hazardous duties.

The impetus for the 1955 changes was retention difficulties arising from the Korean War. Once the Korean War was concluded, the incentive pay system seemed adequate to maintain the lower force levels. This situation prevailed until the Vietnam era when retention difficulties arose once again.

On 1 November 1972, a Joint Service Incentive Pay Study Group was chartered to review flight pay. The stimulus was the FY 73 Appropriations Act which denied flight pay to colonels and generals on noncombat assignments and gave the services until May 1973 to reevaluate flight pay across the board. While the legislation had an ominous tone, it gave the services an opportunity to assess the effectiveness of incentive pay rates and structure as personnel management tools and develop a long term solution to retention problems as regards aviators.

While details must be resolved by legislative action, the Defense Department has proposed that flight pay be accelerated sharply in the early years of rated service and taper in the later years, terminating flight pay for all officers—*but not warrant officers*—at about 25 years commissioned service.

The proposed pay profile will enhance retention of skilled personnel, will reduce flight pay at a time when officers are flying less and supervising more, and will NOT substantially increase the total flight pay tab.

In conformity with the FY 1973 Appropriations Act, a DA message in mid-June terminated flight pay for all colonels and generals except those few occupying bona fide aviation related command or key aviation staff positions. This closely resembles the airborne approach whereby specific TOE "jump spaces" have been designated. However, this is an interim solution and will be in effect until such time as the overall adjustment is made on the front loading proposal.

Flight pay has always been justified as a management incentive tool to attract and retain quality personnel in a hazardous profession characterized by high training and retraining costs. Hence, it's only logical to establish a ratio or percentage of incentive pay to basic pay since it requires a greater incentive to attract and retain a higher grade; therefore, differentials by pay grade and longevity steps are desirable.

Note, if you will, the distinction between the DOD concept of flight pay as a management incentive tool and current misconceptions about flight pay as compensation for the scope of duties performed and the responsibilities therein.

I hope this answers the mail for CW2 Yancey and others.

WILLIAM J. MADDOX JR.
Major General, GS
Director of Army Aviation

MG Maddox is now commandant of the U. S. Army Aviation School and commanding general of the U. S. Army Aviation Center at Ft. Rucker, AL. He was Director of Army Aviation when he prepared the above editorial reply.—Editor

The October issue of the DIGEST will contain a full story about TEAC/HIT as well as additional comments by an AVSCOM Power Plants Branch representative.

Sir:

I read with disbelief and disappointment Danny's answer to LTC M. H. W. on the HIT check in the February 1973 issue. . . .

The greatest advantage of the HIT system over DER (besides being more accurate, which it is) is that the PILOT has the result of the check right then, not belatedly after the day's flying when maintenance gets around to reducing the raw figures. The PILOT knows *right now* that the engine temperature readings are or are not in an acceptable range. If the figure is suspicious, the pilot can immediately recheck (Did he turn off the bleed air? Is anti-icing on? Did he read the right column for temperature? Did he misread the EGT gauge?) and confirm the reading. A 20-degree rise is sufficient to note in the book for maintenance to check, and a 30-degree change is considered sufficient to turn the aircraft down for a maintenance look right away. The HIT and DER systems are specifically intended to provide go/no-go decisions. DER unfortunately tells maintenance it has to go to work (if the aircraft got back O.K.) AFTER the aircraft returned from a day's flying. The HIT system apprises a pilot that an aircraft health problem exists. The HIT system is much less likely to unnecessarily abort a mission than the DER system is to belatedly support an unsatisfactory condition.

Long ago I experienced an inflight engine failure that was attributed to someone else not reporting a hot start or overtemp condition. I believe in HIT because I can check the engine any time of the day after any number of other pilots have flown the aircraft and satisfy myself that the engine health is still good. Furthermore, the *trend* of reading changes is significant, speaking as a maintenance officer. A gradual increase over a number of hours is different from a sharp jump.

A midair collision while running a DER check can spoil your whole day. You don't run that risk while performing a HIT check which takes about 30 seconds. I have made HIT checks for 5 years and haven't turned down a ship yet although I alerted maintenance to problems several times. I compare the

timing of HIT and DER checks to the old Confucius saying, "Better to be on the ground, wishing you were in the air. . . ."

LTC Adolph H. Grimm
Chief, Logistics and Test Support Div
U. S. Army Aviation Test Board
Ft. Rucker, AL 36360

Sir:

In the February 1973 AVIATION DIGEST, "Charlie and Danny's Write-In" refers to the DER and HIT checks. There are two points I wish to take issue with. The first being that "no comparative evaluation has been conducted (between the checks)." In the summer of 1972 I was serving as the Assistant Aviation Safety Officer, 1st Aviation Brigade. Although the details are foggy because of the time lapse, I can remember a briefing conducted by a CWO from the 3d Brigade (Separate), 1st Cavalry Division. His unit had conducted a several month comparative test between the DER and HIT checks (utilizing less than 50 aircraft while conducting combat operational missions). Although I can't quote results, the HIT check indicated a substantial number of potentially hazardous conditions *before* the aircraft broke ground. These included a rag left in the engine air inlet (some FOD inspection!). At least half of the problems indicated by the HIT check were not indicated by the DER check. I can't remember the extent to which the HIT check was then instituted within the 1st Aviation Brigade, but all headquarters aircraft began using both checks.

The second statement concerns the "dubious value" of using the HIT check as a go/no-go gauge. Any check that prevents accidents can hardly be of dubious value (i.e., the rag in the air inlet although not found on the FOD check was found on the HIT check). A last minute abort can adversely impact unit mission accomplishments. So can an accident, particularly if it occurs in the AO.

The use of the DER and HIT tests, in conjunction with each other, by a pilot that understands their indications, can only serve to complement mission accomplishment while saving equipment and lives.

CPT Frederick H. Panhorst
HQ, 75th Field Artillery Group
Ft. Sill, OK 73503

Sir:

I read your answer to LTC M. H. W. in the "Charlie and Danny's Write-In" column in the February 1973 issue concerning the HIT and DER checks.

Since I developed the HIT check and assisted the U. S. Army Aviation Center and School in setting up the HIT program, I should like to comment on the HIT check.

The HIT check is based on standard engine data correction procedures that are recognized and used throughout industry and the military (i.e., Flight Test Engineering Manual, U. S. Air Research and Development Command Technical Report No. 6273, May 1951). The exhaust gas temperature (EGT) and the gas producer turbine speed (N_1) are corrected by use of the ratio and square root of the ratio of the absolute outside air temperature and absolute standard day temperature.

An example of the accuracy of the DER check versus the above procedure is shown in figure 1.

Figure 1

Recorded OAT = 20° C.
N1 = 90.2%
EGT = 480° C.

DER Corrected Values	*Standard Data Corrective Pro.*
N1 = 89.87%	**N1 = 89.43%**
EGT = 475° C.	**EGT = 467° C.**

An example of the relative accuracy of the HIT and DER checks against the normally accepted method of correcting engine performance is shown in figure 2.

As can be seen in figure 1, the DER check is 0.44 percent N_1 above that value calculated by standard procedures and the EGT is 8 degrees C. above that calculated by standard procedures. The following (figure 3) is a comparison of accuracy of HIT and DER versus the standard data correction procedures (figure 2):

Figure 3

HIT	*DER*
N1 = 0.08% high	**N1 = 0.45% high**
EGT = 0.4° C. high	**EGT = 8.4° C. high**

It is thus quite evident that the HIT procedure more accurately produces the results of the standard data correction methods. In addition, it should be noted that since torque is not used as a measuring parameter, no correction is required for pressure altitude and no standard pressure altitude is required in performing a HIT check. For a further explanation of this and a discussion of the development of the HIT system, I suggest a paper on HIT entitled "A Gas Turbine Engine Health Indicator for Helicopter Operators" which was published in the JOURNAL OF THE AMERICAN HELICOPTER SOCIETY, Vol. 16, No. 1, dated January 1971.

From a safety-of-flight viewpoint alone, the advantage of HIT should not be ignored. The added danger of performing DER, while airborne, is one of the main reasons that the HIT check was authorized for use at Ft. Rucker where aircraft density can present a hazard. If the HIT check is safer from this standpoint at Ft. Rucker, it is safer anywhere. As I have stated previously, the baseline EGTs and related N_1 speeds are developed based on standard engine data correction procedures.

Continued on page 31

Figure 2

Recorded OAT = 20° C.
N1 = 90.7%
EGT = 515° C.

HIT	*DER*	*Standard Data Corrective Pro.*
OAT = 15° C.	**OAT = 15° C.**	**OAT = 15° C.**
N1 = 90%	**N1 = 90.37%**	**N1 = 89.92%**
EGT = 502° C.	**EGT = 510° C.**	**EGT = 501.6° C.**

INSTRUMENT CORNER

Q. If on a VOR RWY 36 approach, circle to land RWY 18, I lose visual contact with the ground in a left turn after passing MDA, which way should I turn to execute a missed approach (missed approach procedure states, "climbing *right* turn to 2500 direct to VOR")? (see figure 1)

A. Page 1-68, paragraphs 1 and 2 (MISSED APPROACH) of Airman's Information Manual states: "When a landing cannot be accomplished upon reaching the missed approach point defined on the approach procedure chart, the pilot must comply with the missed approach instructions for the procedure being used or with an alternate missed approach procedure specified by air traffic control. If visual reference is lost circling to land from an instrument approach, the missed approach specified for that particular procedure must be followed (unless an alternate missed approach procedure is specified by air traffic control). To become established on the prescribed missed approach course, the pilot should make an *initial climbing turn toward the landing runway* and continue the turn until he is established on the missed approach course. Inasmuch as the circling maneuver may be accomplished in more than one direction, different patterns will be required to become established on the prescribed missed approach course depending on the aircraft position at the time visual reference is lost. Adherence to the procedure, illustrated by the following examples, will assure that an aircraft will remain within the circling and missed approach obstruction clearance areas." (figure 2)

Figure 1

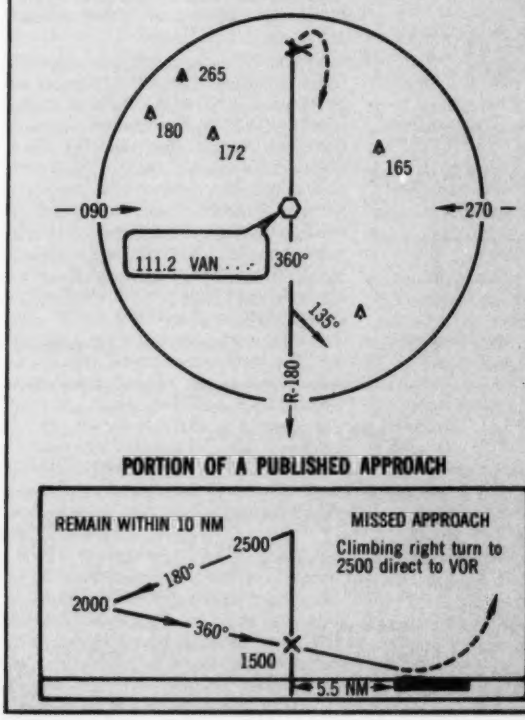
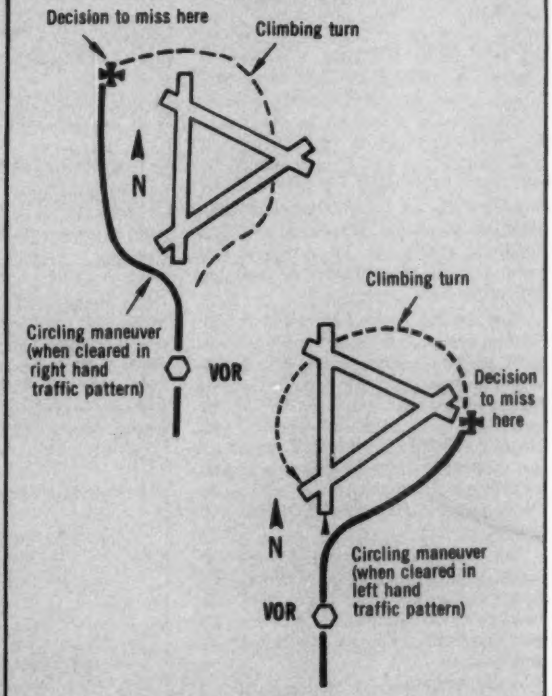
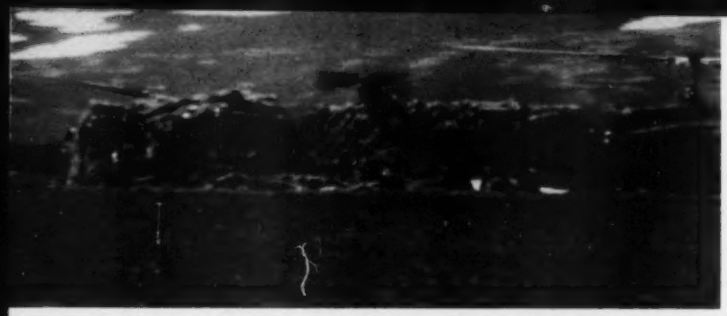


Figure 2





Lieutenant Kenneth M. Steffen
Public Information Officer
Missouri Army National Guard

Like Manna From Heaven

. . . at least to approximately 1,000 head of starving cattle. That's how the hay dropped by the Missouri National Guard must have seemed. Two UH-1 helicopters and 12 Guardsmen from the 635th Aviation Company in Warrensburg flew 900 bales of hay to feed the cattle of Harrison County in northeast Missouri, stranded by unseasonable weather in April. County Sheriff Melvin Smith requested help from Missouri Governor Christopher S. Bond after some local cattle had not been fed for 3 days due to deep mud, drifting snow and 60-mile-an-hour winds.

SEPTEMBER 1973

These articles stress noise abatement; h
maneuvers in order to achieve this. T
envelope and mission profile as prescr
(-10). Accordingly, paragraph 5.1, A
is quoted in part: "Army aviators will
safety of personnel and property will

LT Arthur J. Negrette
California Army National Guard
49th Aviation Company

Whap You Say?

WITH THE INCREASE of domestic helicopter operations, it is desirable to reduce the aural annoyance of helicopter movements over populated areas. As an initial effort, this overview of the helicopter noise problem has been prepared to provide an account of helicopter noise, its impact upon the physical environment and possible abatement procedures.

Four primary sources of external noise generation can be identified for the turbine powered, single rotor helicopter. They are:

- Control devices such as the tail rotor.
- Main lifting rotor(s).
- Drive system(s).
- Power plant(s).

With the exception of noise emitted by tail rotor control devices, these and subsequent noise sources generally are applicable to both tandem and single rotor helicopters.

Unfortunately, it is not possible to identify any of these four sources as dominant for all helicopters.

Continued on page 32

t; however, pilots will not perform nonstandard is. The aircraft must operate within the flight escribed in the appropriate operator's manual l, Army Regulation 95-1, 20 December 1972, will operate aircraft in such a manner that the vill not be jeopardized"

C. R. Cox
Research Project Engineer
Bell Helicopter Company

How to Operate the Medium Helicopter More Quietly

This article tells you about conditions which produce higher noise levels during operation of UH-1 series helicopters. The author uses Bell models 204B, 205A and 212. These are comparable to the Army's UH-1B and UH-1D, and the Navy's UH-1N

WHEN YOU START operating a medium helicopter in new territory, you add a new spectrum of sound to the usual noise environment. If that territory is a municipality, thousands of people will hear the new sounds and know where they are coming

Continued on page 33

Wives' Fall Safety Rules

Sergeant First Class Herbert Denmark

FALL IS HERE and the miniskirts and hot pants are RONing farther south. So, a man's fancy turns to football—collegiate and professional—TV type.

The Saturday and Sunday afternoon games are upon us. Wives, lend me an ear! You will fair much better this year after reading a few rules for a fall football afternoon. As a matter of fact, you may be at an advantage during the time that your flying "crewman" has his eyes locked onto the "boobtube." Keep your marriage *and* flying-type husband safe by following these fall safety rules.

Rule 1: Do suggest that your spouse buy a portable TV set so that he can take it to any part of the house to watch the game(s). You will have the main living-room area and the console TV for yourself to enjoy.

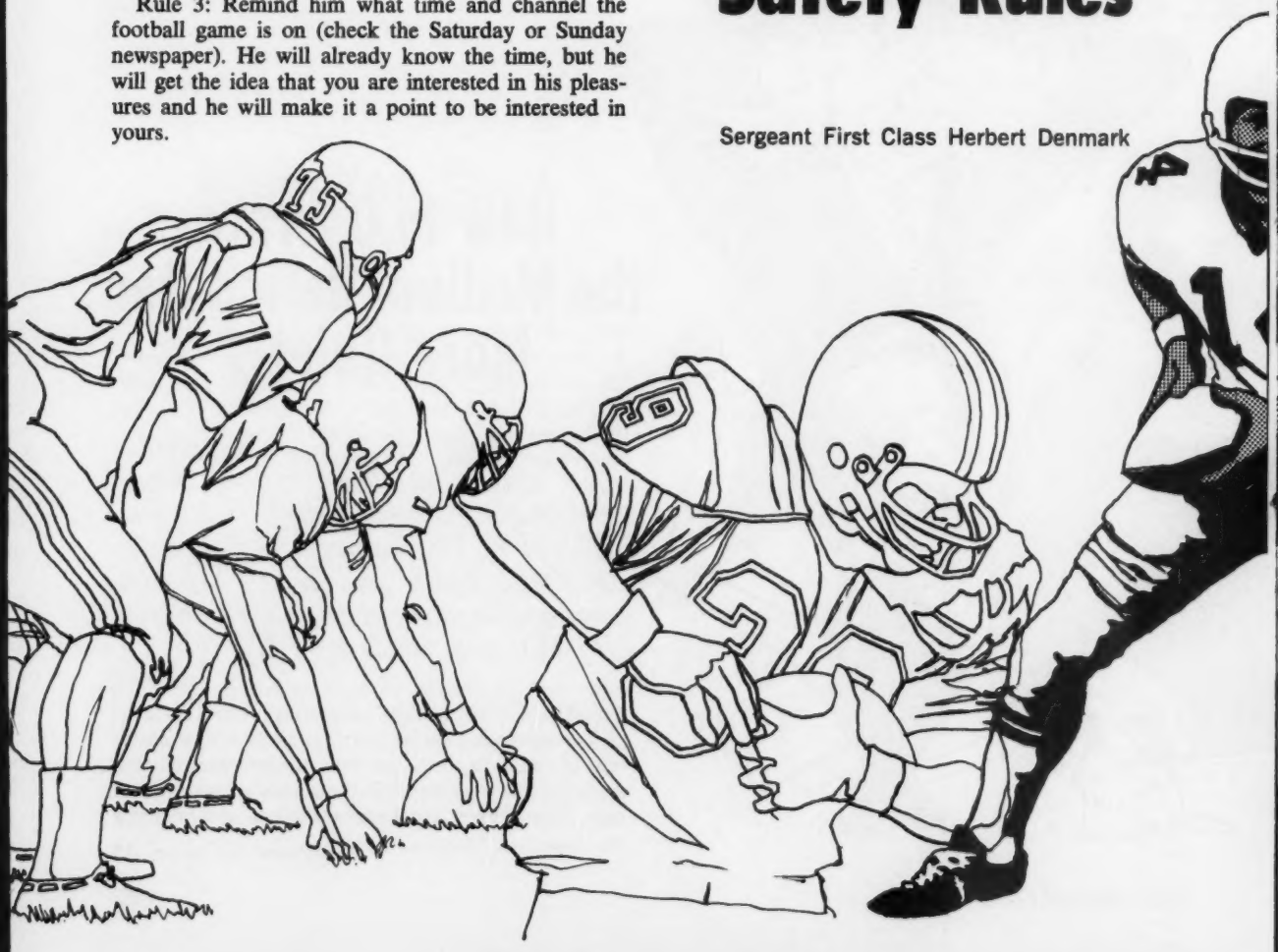
Rule 2: On Sunday attend an early church service, if it is your desire, so he won't get restless in church when kickoff time is near and the sermon is still in progress. You may save the price of a fine for a speeding ticket also.

Rule 3: Remind him what time and channel the football game is on (check the Saturday or Sunday newspaper). He will already know the time, but he will get the idea that you are interested in his pleasures and he will make it a point to be interested in yours.

Rule 4: Serve him a snack during the game. Be sure it's a small one—don't contribute to the midriff bulge. If he insist on seconds remind him of that coming session with the flight surgeon.

Rule 5: Plan dinner to begin *after* the games are completed.

Rule 6: After the games ask him who won. You could care less, but he will enjoy telling you all about who did what. If you really want to gain points, remember the name of the quarterback for one of the teams, any one, and ask "old tired eyes" how the player performed.



Rule 7: Give your mate 30 minutes to settle his nerves after the final gun. He can get quite involved in a close game and really be pooped afterwards.

Rule 8: Watch the games with him. Try it, you may like it.

Rule 9: Don't ask him to go for milk, bread or other nonemergency items during the game. These items can wait until after the game to be picked up.

Rule 10: Don't let the children play their rock and roll records close to where dad is watching the game. After all, they have 5 days a week to rock—dad has one weekend for football.

How to keep from getting clobbered during the football season

Rule 11: Don't try to talk about family problems with hubby during the game. If you have something important to discuss, this certainly isn't the time for a conference.

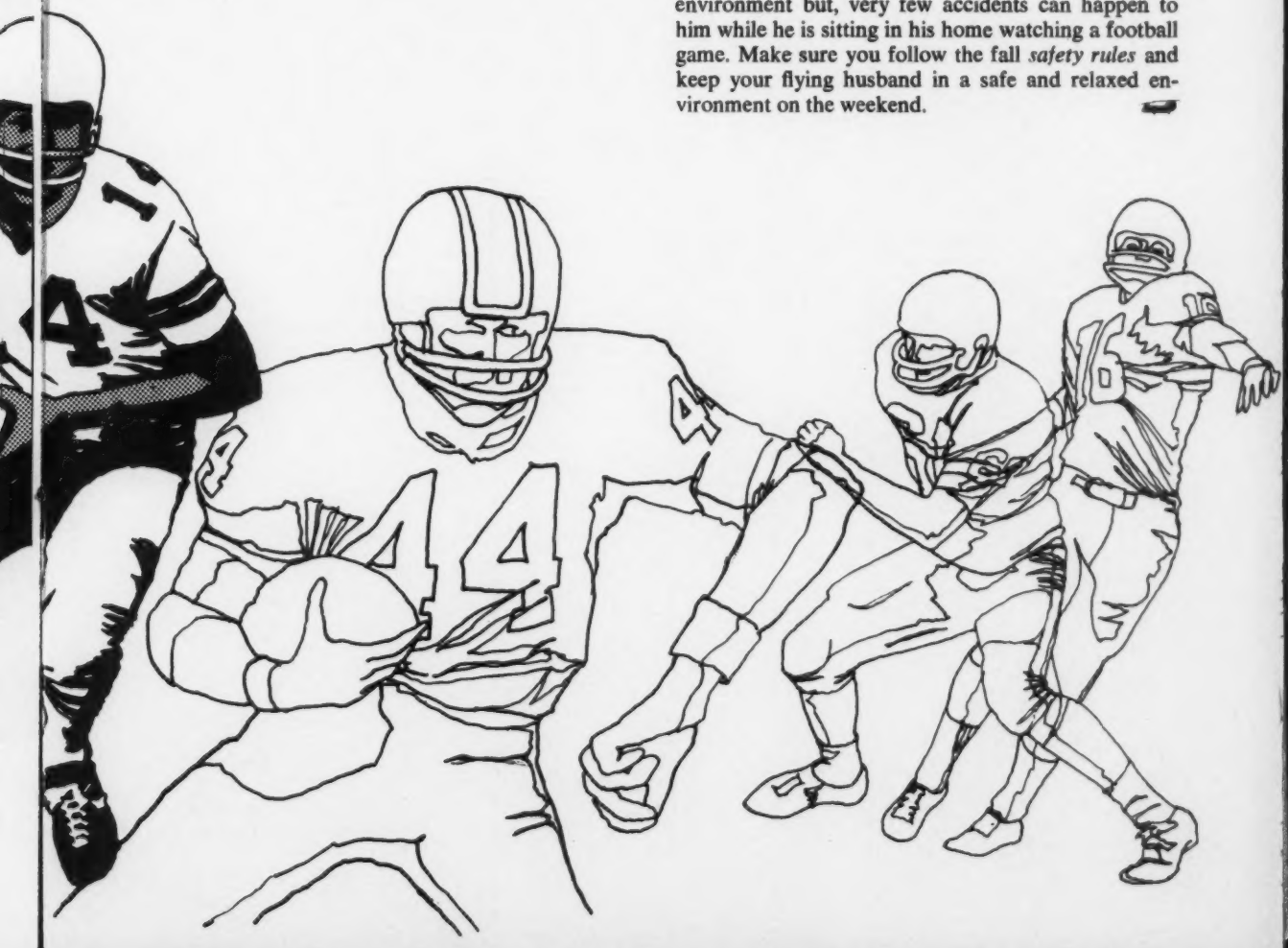
Rule 12: Don't call him outside to stop the children's quarrels. The Bears may be on the Packers' 1 yard line with fourth down coming up. If he has to miss this play, the children may really get an unfair settlement imposed upon them.

Rule 13: Don't ask silly (to him) questions like, "Why are they playing in the rain?" "You said there were 2 minutes left to play in the game 10 minutes ago, what happened?"

Rule 14: If you must talk wait for a commercial. Then tell him you love him.

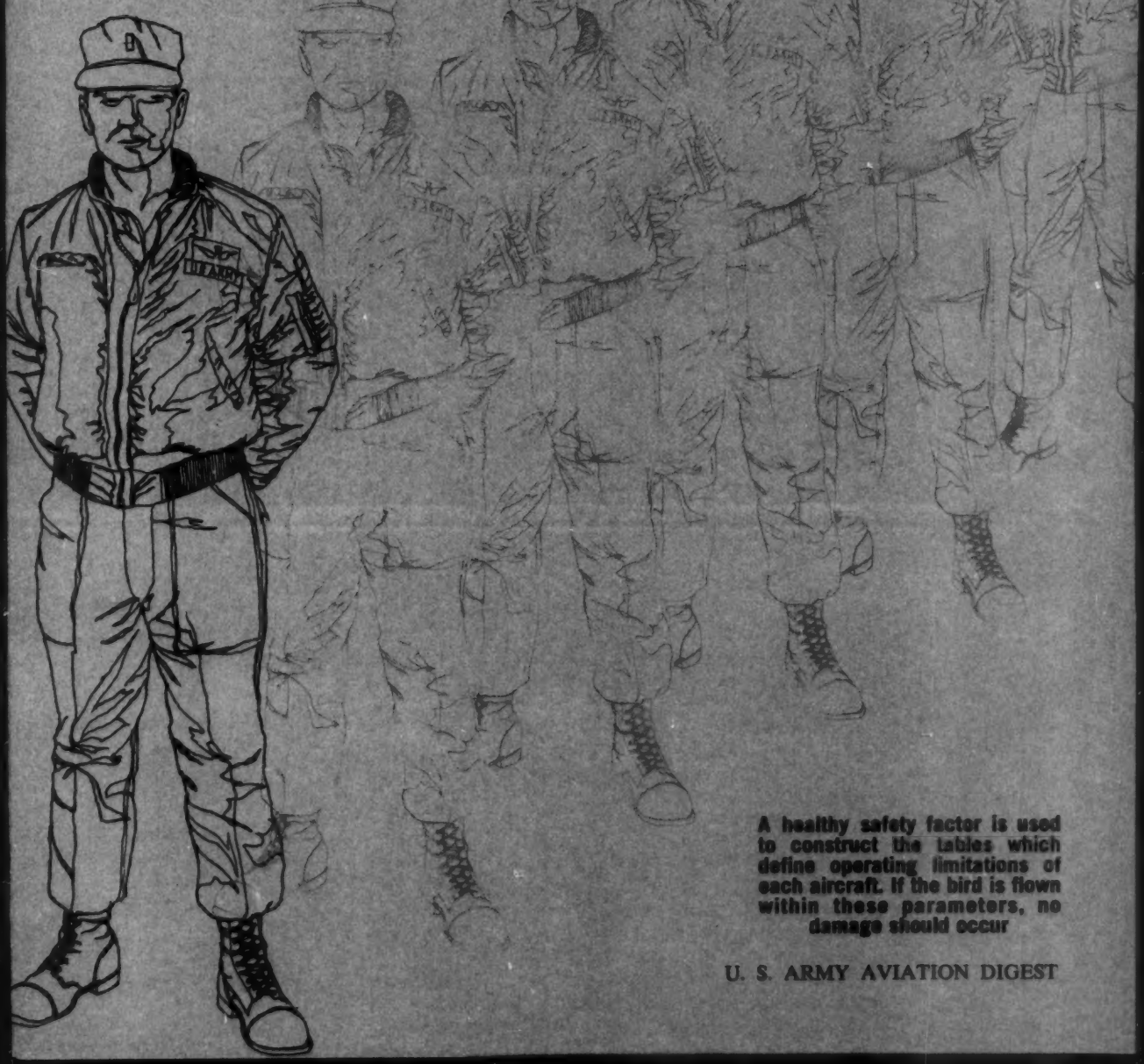
Rule 15: Don't put on your sexy minidress and try to lure him away from the game. *Please don't ask,* "What is more important, the game or me?" You know that you are his most prized possession so don't bug him now.

All week long he has worked in an accident prone environment but, very few accidents can happen to him while he is sitting in his home watching a football game. Make sure you follow the fall *safety rules* and keep your flying husband in a safe and relaxed environment on the weekend.

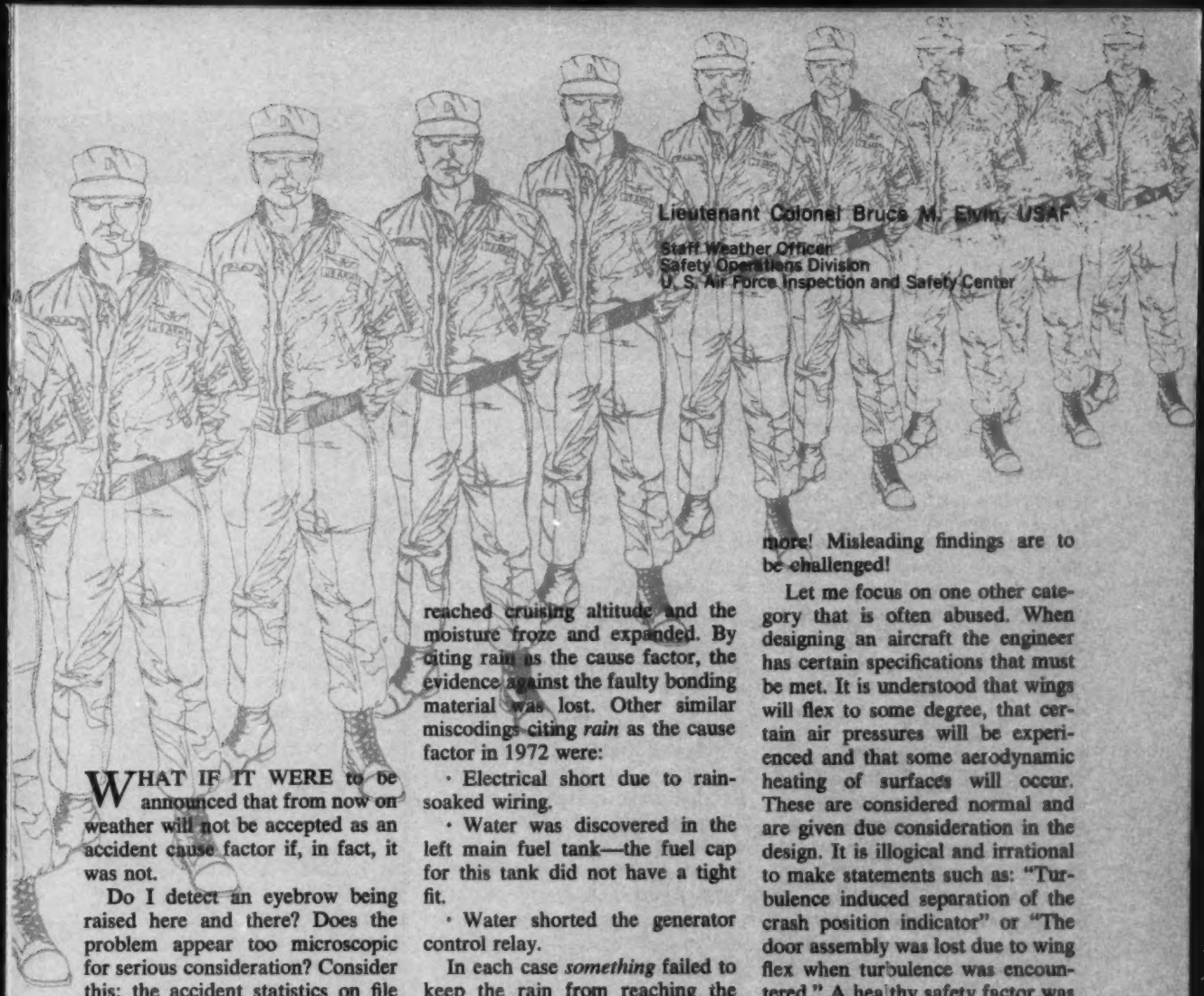


STAND UP— and be counted

Adapted from an article appearing in the U. S. Air Force's Safety Officers Study Kit



A healthy safety factor is used to construct the tables which define operating limitations of each aircraft. If the bird is flown within these parameters, no damage should occur



Lieutenant Colonel Bruce M. Elvin, USAF
Staff Weather Officer
Safety Operations Division
U. S. Air Force Inspection and Safety Center

WHAT IF IT WERE to be announced that from now on weather will not be accepted as an accident cause factor if, in fact, it was not.

Do I detect an eyebrow being raised here and there? Does the problem appear too microscopic for serious consideration? Consider this: the accident statistics on file can provide the best justification for a change. There is no better reason for modification than to save Air Force [Army] resources. But unless cause factors are identified honestly and accurately, they end up in the wrong place and we gain nothing from the analysis.

Let me give you some examples of findings that failed to name the true cause factors, thus allowing the faulty part or practice continued existence.

"The waterproof bonding allowed moisture to seep between . . ." With this opening statement, the investigator described the resultant damage when the aircraft reached cruising altitude and the moisture froze and expanded. By citing rain as the cause factor, the evidence against the faulty bonding material was lost. Other similar miscodings citing *rain* as the cause factor in 1972 were:

· Electrical short due to rain-soaked wiring.

· Water was discovered in the left main fuel tank—the fuel cap for this tank did not have a tight fit.

· Water shorted the generator control relay.

In each case *something* failed to keep the rain from reaching the critical area.

Icing is another catchall for material failures that were not cited for their deficiencies of design:

· Some radio antennae were unable to carry a buildup of ice.

· After the pitot heaters failed, icing blocked the pitot system.

· Some aircraft have no anti-icing capability. Yet, when flown into icing conditions, the expected occurs.

Rather than answer the question of why they were violating the flight manual and flying in icing conditions, it is easier (more impersonal) to write it off to a meteorological phenomenon. But no more! Misleading findings are to be challenged!

Let me focus on one other category that is often abused. When designing an aircraft the engineer has certain specifications that must be met. It is understood that wings will flex to some degree, that certain air pressures will be experienced and that some aerodynamic heating of surfaces will occur. These are considered normal and are given due consideration in the design. It is illogical and irrational to make statements such as: "Turbulence induced separation of the crash position indicator" or "The door assembly was lost due to wing flex when turbulence was encountered." A healthy safety factor was used to construct the tables which define the operating limitations of each aircraft. If the bird is flown within these parameters no damage is expected. But if damage does occur, then it becomes necessary to change the design criteria by using stronger materials, subjecting the aircraft to less force by limiting some or all facets of its performance, redesigning the structures to carry a greater load, etc. We do *not* correct the deficiency by citing weather as the factor as if it were completely unexpected and totally overpowering, thereby hiding the justification for change under a wrong heading.

Beware The FL

CW2 Robert C. Monk

The author recalls an encounter with ice while flying a U-6 Beaver. This aircraft has become somewhat scarce in the active Army inventory, but the moral of the article is valid

THERE WAS one thing about CW2 Jimmy Olsen that bugged me! He always seemed to be *very* concerned about what the freezing level was forecasted to be for each mission.

When I asked Jimmy why he always was so worried about the freezing level (I remembered all the training in meteorology class about icing but I had never encountered it so, unfortunately, it really hadn't made much of an impression on me), his answer was to ask me if I had even been caught in icing conditions with no deicing equipment. My answer was "No" and he said, "Well, *I have,* and that's why I'm always careful that it doesn't happen again."

As fate would have it, it wasn't long until I was to receive my "ice" indoctrination. After that I too would always try to prevent it from happening again.

The very next mission was a courier flight to New Cumberland Army Depot in Harrisburg, PA, then to the Cessna Aircraft Corporation in Wichita, KS, and then to Ft. Knox, KY. It was my turn to be pilot and Jimmy was copilot. We were flying the U–6A Beaver with which we were both familiar. He had flown it extensively since flight school and I had received all my instrument training in the Beaver.

The first leg of the trip was routine and uneventful. We arrived at New Cumberland Depot around 1100 hours, delivered our package and ate lunch. Arriving back at the airfield we checked weather and NOTAMs and filed an IFR flight plan for our first fuel stop destination (don't remember now where it was). The weather was poor—low ceilings and the like—but mostly stratus type clouds. The freezing level was forecast to be 11,000 feet and we were going west so we filed for 6,000 feet.

We started up, got our clearance and took off. As soon as we switched from departure control to center, we received an altitude assignment of 8,000 feet. I requested to stay at 6,000 feet but the request was denied. So I reported out of 6,000 for 8,000.

Not long after leveling off I started noticing traces of ice forming on the leading edges of the wings. I thought this a little strange since the freezing level was supposed to be 11,000 feet. I'm not sure what happened, whether the freezing level dropped after our briefing or we were given erroneous information, but with the altitude change received by the air traffic control center the two of us got together.

I informed center of the ice starting to form and requested a lower altitude. Center advised us that a lower altitude was not available at the time but would give us one as soon as possible . . . and to maintain 8,000 feet. I acknowledged the transmission and started to worry.

I knew that if the ice formation rate remained the same we would probably receive clearance to lower altitude before it presented any

real problems. No such luck, the ice built up faster and faster and within 20 minutes it was thick enough that I was having difficulty maintaining altitude. All this time I was requesting a lower altitude.

Everything finally deteriorated to the point that I had METO (minimum except takeoff) power set in and was losing altitude. I declared an emergency, informed center of the fact that I was unable to maintain the assigned altitude and requested clearance to a small airport with a VOR approach a few miles north of the airway (we had found it while planning what we were going to do if the situation did get out of control).

We were granted clearance and made a beeline for the VOR. During tracking to the VOR I felt that something was wrong with the controls. I tried to move the control column and it wouldn't move at all. The controls were frozen! I almost panicked, but finally regained my senses and with Jimmy's help we shook them loose.

We already were below the procedure turn altitude by the time we reached the VOR. I knew there were some tall hills on the approach course outbound and also that the VOR was located on the airfield. I elected to make continuous turns around the VOR instead of trying to go out and get on the final approach course.

The weather was about 500 feet overcast in that area, so I decided that if I had to crash I'd rather crash close to the airport than out in the hills. We were within 50 feet of the minimum descent altitude when we broke out into a chimney-shaped hole. I looked down and saw a big white number 25, pushed the control column forward and started down with the flaps. Boy, I'd never been so glad to see ole mother earth before.

The air speed built up a little during the descent to land, but this must have been a good thing because when I rounded out the aircraft immediately stalled out and fell through about 3 or 4 feet. As soon as the aircraft touched down all the ice fell off. With the sudden decrease in weight and the extra air speed, the aircraft quickly became airborne again. After a few quick pitch changes and reestablishing a short final and another roundout, I finally got the U-6 on the ground again and stopped. We both breathed a big sigh of relief.

We sat there 4 days before the weather cleared and by then we had built up enough courage to complete the mission.

VIEWS FROM READERS

Continued from page 21

The HIT program is intended as a go/no-go check. If the aviator has no method of allowing for the effect of outside air temperature on EGT, he will compare the indicated EGT with what he remembers or thinks the EGT should be. Previous experience has shown that missions will be aborted based on the pilot's estimation of what the EGT should be. The HIT check provides the pilot a method of compensating for ambient temperature effects. It is thus more likely to prevent unwarranted mission cancellation than if no procedure is used. In addition, I believe that information on engine condition should be available to the pilot, since he definitely is the man most interested. An increase of 30 degrees C. over the baseline HIT EGT is considered reason to return the aircraft for maintenance.

The HIT check has been proposed to the Army several times since it was originally proposed in May 1967. It is currently being reevaluated. If I can furnish any information or assist anyone concerning HIT, I shall be pleased to do so.

F. J. McCrory Jr.
Aerospace Engineer
U. S. Army Aviation Test Board
Ft. Rucker, AL 36360

• The following answer to the questions posed by Captain Panhorst, Lieutenant Colonel Grimm and Mr. McCrory was received from the U. S. Army Aviation Systems Command:

From a safety standpoint the advantage of doing a HIT check on the ground versus doing a DER check when airborne is vastly overrated and overstated. Catastrophic failures are not precipitated instantaneously unless externally caused. That is, an aircraft engine would not exhibit a sudden quantum shift in EGT or N_1 speed and then fail with no prior loss of performance. Thus, whether performance data is a day old or an hour old is not significant. The trend of this data over a previous specified time period would be significant.

It is recognized that HIT has value as a GO/NO-GO indicator for the pilot prior to takeoff on a mission. This, however, was not the intention of the DER check. The DER check was developed as a maintenance tool to aid in determining when performance degradation was occurring. The turbine engine analysis check (TEAC) used in conjunction with DER can determine the degree of degradation and can aid in determining the cause.

Performance of the DER check in flight should provide more stable data in general. The HIT check is done on the ground with sufficient N_1 speed that the aircraft is light on its skids or nearly hovering.

The mathematical accuracy of the HIT check computations is not disputed. The same accuracy could be obtained for the DER check by utilizing a worksheet similar to that of the HIT check. This would entail creation of a new DA form since none of the existing maintenance record forms appear adaptable. At any rate, the approximations utilized in the DER procedure considering the accuracies of the aircraft/engine instrumentation are adequate.

The only question left unanswered [to the three letters above] is Captain Panhorst's reference to a briefing on a comparative test being conducted between the DER and HIT checks which would seem to contradict the statement in the DIGEST article that "no comparative evaluation has been conducted (between the checks)." Systems Engineering informs us that no *official* checks have been conducted and that the one mentioned was an unofficial check conducted by an individual unit.

WHAP YOU SAY ***Continued from page 24***
It is possible, however, to identify one type of main rotor noise, "blade slap," as prevailing over any other rotorcraft noise associated with helicopter operations *when it occurs*. Blade slap, described as a loud and often intense popping noise, predominates over all other types of noise, and because of its distinctive aural characteristics, it can also be the most objectionable.

Two popular explanations for the origin or cause of blade slap relate the interaction of the main rotor blades to the flow of air surrounding the rotor disc. In one case, blade slap is attributed to high forward speeds where the main rotor enters the compressible-flow region. Bell Helicopter Company researchers and others associate this "high speed blade slap" with the onset of compressibility effects on the advancing blade and the occurrence of local supersonic flow.

Blade slap also is recognizable during flight conditions not associated with high forward speeds. For these cases blade slap is reported to be a direct result of fluctuations in lift caused by the interaction of a blade and a vortex filament. More specifically, it is proposed that main rotor blade slap in low speed flight—during partial power descents, decelerations and turns—is caused by the rapid changes in angle of attack which a blade experiences as it encounters its own or a previous blade's vortex (see figure 1 on page 34). This results in abrupt variations in blade lift and drag leading to an intrusive-type noise containing a broad range of frequencies.

At high forward air speeds (above 110 knots) the external (outside the aircraft) noise exposure of blade slap is intensified to its maximum levels. Internally (within the aircraft) this high noise exposure is not recognized by the crewmembers since it is propagated in forward and vertical directions rather than spherically.

In those cases where blade slap is generated due to other than high forward speeds (i.e., partial power descents, turns, low speed flight, etc.), its external intensity can also reach maximum levels. However, in those cases blade slap is recognizable by crewmembers, allowing them to identify the "blade slap boundaries" of their particular aircraft and to initiate abatement procedures.

Before the aviator can successfully minimize the noise exposure and annoyance resulting from helicopter operations, he must be able to identify those flight conditions associated with blade slap. Figures 2 and 3 have been extracted from the manufacturer's (Bell Helicopter Company) literature and present blade slap as a function of air speed, vertical velocity and turn rates for the UH-1 series aircraft. Figure 4 indicates those regions of above normal noise (blade slap) for the light observation helicopter (OH-58) as a function of vertical velocity and air speed. Although the flight conditions which generate maximum blade slap are similar for the two aircraft, it is easily recognizable that the slap boundaries for the UH-1 extend over a greater range of the aircraft's operating envelope and with a greater intensity.

It becomes apparent after reviewing figures 2, 3 and 4 that benefits in the form of reduced noise exposure can be achieved by varying flight profiles and maneuvers. The abatement procedures discussed below are guidelines for the aviator, to be implemented as safety and mission requirements allow.

Planning: If possible, flights should be scheduled to avoid departure or arrival during periods when noise transmission is most extensive due to meteorological conditions. Sound propagation is more intense usually at night, in early morning and when the air is cool and stable. (A detailed discussion of meteorological conditions and sound may be found in the story "How To Operate The Medium Helicopter More Quietly," by C.R. Cox in this issue.)

Takeoff and climb: Takeoffs and climbouts generally produce less noise and the community annoyance is reduced when planned departure routes and altitudes are flown. The following, when compatible with mission requirements and safety of flight, will minimize the intrusiveness of takeoff operations.

The near vertical takeoff, when performed with smooth control inputs and a positive application of power, is effective in reducing the noise exposure resulting from takeoff maneuvers. As the aircraft breaks ground it is rotated into a near vertical takeoff configuration, achieving a 500 to 1,000 feet per minute rate of climb. Once this rate of climb has been established, a smooth transition to forward flight may be performed (figure 2, page 35). [*Editor's note: A vertical takeoff places the helicopter in the "avoid area" of the height-velocity envelope for a longer period of time than any other type of takeoff.*]

The advantages of a vertical takeoff can be lost on the departure climbout if prudent judgment is not practiced. During this phase of the flight the aviator should avoid noise sensitive areas such as churches,

schools and residential developments and when possible select routes over open spaces, industrial areas, or over water but within autorotational distance of land.

Maneuvers and cruise flight: Avoid high "g" turns and steep dives with rapid pullouts near the ground. As figure 3 (page 36) illustrates, blade slap occurs in turns which exceed 1.5 g with air speeds between 50 to 90 knots in a left turn and between 40 to 110 knots in a right turn.

As cruise air speeds exceed 110 knots blade slap becomes the predominate noise increasing in intensity up to the aircraft's V_{ne}. For most UH-1 helicopters cruise air speeds between 85 to 110 knots are optimum for noise abatement purposes.

Landing and descents: It is curious to note that the helicopter's maximum noise exposure is produced during the descent and landing phase, while the airplane exhibits its most "charming" aural qualities during this same sequence. It also is interesting that most rotary wing aviators (newly rated and seniors) operate their aircraft regularly within those combinations of air speed and rate of descent that produce the maximum levels of blade slap, i.e., 60 to 80 knots and a 400 to 500 feet per minute descent. [*Editor's note: Some helicopters are not equipped with vertical speed indicators to measure this rate of descent, thus use of proposed maneuvers may not be feasible.*] The following noise abatement procedures have been developed by researchers for minimizing noise during the descent and landing phase of helicopter operations (also see figures 4 and 5, pages 37 and 38):

- When initiating the descent for an approach or lower altitude, establish a rate of descent of at least 200 to 400 feet per minute before reducing the aircraft's air speed. The air speed may then be reduced to approach or descent speeds as the rate of descent is increased to 800 to 1,000 feet per minute.
- The transition to the approach glide slope and the approach itself should be flown at an air speed of between 50 to 80 knots while maintaining an 800 to 1,000 feet per minute rate of descent.
- If main rotor blade slap becomes apparent, increase the rate of descent.
- Approaching the flare the aviator should reduce the forward air speed to below 45 to 50 knots before decreasing his rate of descent.
- Execute normal flare and landing, decreasing rate of descent and air speed. [*Editor's note: Use of this technique will place the aircraft in the "avoid area" of the height-velocity envelope.*]

The difference between the noise abatement approach and the normal approach is the establishment of a descent *before* the reduction of air speed and a steeper approach slope.

The population over which frequent helicopter movements occur would welcome the employment of these flight techniques designed to reduce the aural annoyance to which these inhabitants are now subjected.

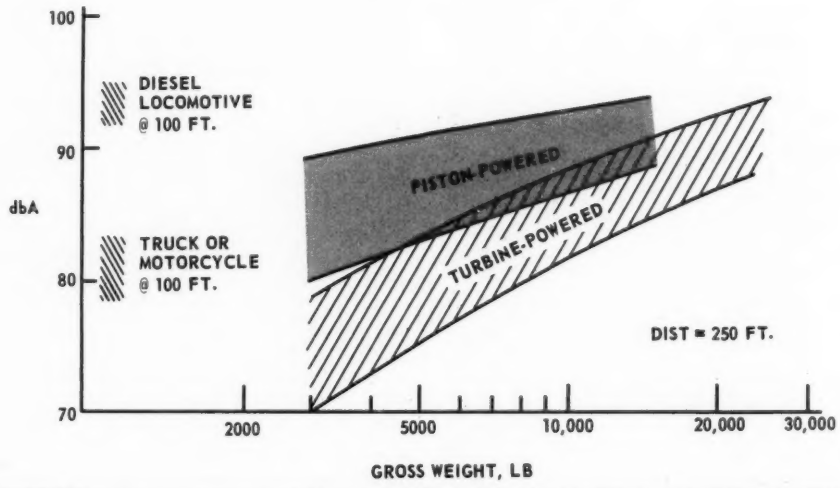
HOW TO OPERATE THE MEDIUM HELICOPTER MORE QUIETLY

Continued from page 25

from. How they will react depends upon many complex physical, economic and psychological factors, but one thing is certain: They will react strongly, adversely and actively if the sound is too irritating, if it represents something that seems to threaten their safety and well-being, or if they cannot see how the noisemaker benefits them. Although it is up to the operator to educate the public about the safety and usefulness of the helicopter, the pilot can make the public less hostile to the helicopter (and to the operator's arguments about its safety and community service) by flying in such a way as to make the sound of his aircraft as unirritating as possible.

Figure 1 shows the trend of helicopter noise levels and where the medium helicopter (5,000 to 12,000 pounds gross weight) fits into the overall noise picture. The units of the vertical scale represent, to some extent, the degree to which a sound will annoy the average human listener. We can't say what sound level will make the housewife, school teacher or hospital patient complain to the authorities. Instead, we show on the figure the sound level of a diesel locomotive and a truck or motorcycle. You can compare this with the sound of the helicopter and draw your

FIGURE 1
TREND OF HELICOPTER NOISE LEVELS



own conclusions.

Notice that the noise level of a turbine-powered helicopter at a given gross weight covers a range. This is true not only for these helicopters in general, but also for a particular helicopter—the particular one you may find yourself flying, for example. What you need to know is how you can fly that helicopter, given a certain gross weight, in the lower portion of this range of sound levels—at least when you are flying near people whom noise might bother. This writeup tells you about the conditions which produce the higher noise levels during the operation of medium turbine-powered helicopters such as Bell models 204B, 205A and 212 (UH–1B, UH–1D and UH–1N), and describes flight techniques which will help you to avoid them. A companion writeup contains similar information for light helicopters.

FLIGHT CONDITIONS ASSOCIATED WITH ABOVE-NORMAL NOISE

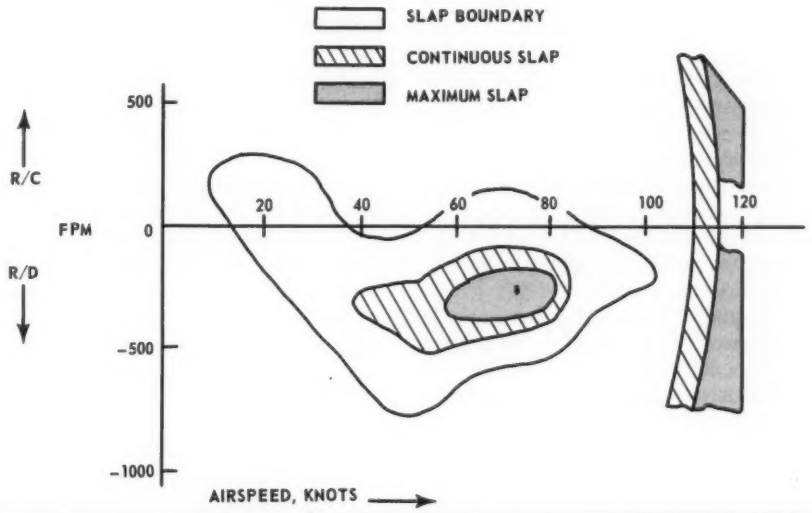
The unique acoustical signature of the medium helicopter is partly due to the modulation of sound by the relatively slow-turning main rotor. This modulation attracts attention, much as a flashing light is more conspicuous than a steady one. The modulated sound is often referred to as "blade slap." Blade slap occurs during high-speed forward flight when a main rotor blade enters the compressible-flow region on the advancing-blade side. Shock waves make the blade's airloads fluctuate, often quite rapidly, and these fluctuations generate noise. For a typical medium helicopter, this occurs at air speeds above about 100 knots. Blade slap can also occur at lower speeds, when a blade intersects its own vortex system or that of another blade. When this happens, the blade experiences locally high velocities and rapid angle-of-attack changes. This can momentarily drive a portion of the blade into compressibility and possibly shock stall, both of which produce aerodynamic loading variations. Either or both mechanisms generate noise. This can occur in low-speed level flight, during partial power descents and in turns. Figures 2 and 3 show where you can expect models 204B, 205A and 212 to get noisy, giving blade slap regions as functions of air speed, rate of climb (R/C), rate of descent (R/D) and g loading during turns.

Low-Speed Level Flight and Partial Power Descents

In low-speed level flight, the main rotor slaps to some degree at air speeds between 10 and about 85 knots. The worst condition is between about 60 and

FIGURE 2

NOISY FLIGHT OPERATIONS – MEDIUM HELICOPTERS



80 knots, where the rotor slaps almost continuously. At other air speeds, it slaps intermittently, an action which can be triggered by wind gusts and by transitioning from slight climbs to descents. Maximum blade slap occurs during partial power descents—at air speeds between 60 and 80 knots and rates of descent between 200 and 400 fpm. (Engine torque pressure usually varies from 10 to 25 psi.) This slap is caused by the blade interacting with the wake. Although the noise produced at these descent rates is not extremely loud to crewmembers inside the helicopter, they can recognize it easily and define the "slap boundaries" for their particular helicopter. Of course, people on the ground hear slap increase in intensity as the helicopter descends.

Cruise Air Speeds

At air speeds above about 100 knots, blade slap intensifies and sounds louder to the people on the ground than does that of any other flight condition of the medium helicopter. Unfortunately, the crewmembers do not hear it so, because this blade slap propagates forward of the helicopter (primarily) instead of spreading spherically.

Maneuvers

Blade slap also occurs during constant speed turns if turn rates are too high. Here the main rotor blade and wake interact in much the same manner as in partial power descents. As figure 3 shows, continuous slap occurs in turns which exceed 1.5 g with air speeds between 50 and 90 knots in a left turn and between 40 and 110 knots in a right turn. There is little difference in the intensity of the noise in right or left turns once the critical g is reached. The crew can hear this sound easily.

HOW TO MINIMIZE NOISE

In general, you can eliminate the most offensive noise of the 204B, 205A and 212 helicopters by keeping them out of the slap regions shown in figures 2 and 3. This is not always possible, of course, and when the slap regions cannot be avoided, they should be flown through as quickly as possible. There are also other methods of reducing helicopter noise, and you should use them when you can, whether you are flying in a slap regime or not.

Routes and Air Speeds

1. Fly at highest practical altitude during approach to metropolitan areas.
2. Select route into terminal over least populated

area.

3. Follow major thoroughfares or railway roadbeds.

4. Do not exceed 110 knots when within 5 miles of suburban areas.

5. Within 3 miles of densely populated areas, maintain a cruise speed of approximately 100 knots and reduce rpm to the minimum allowed by the flight manual of the particular helicopter.

6. Select the final approach route with due regard to the type of neighborhood surrounding the terminal and the neighborhood's sensitivity to noise. Assess this sensitivity beforehand for each terminal. Some of the guidelines are:

a. Approach keeping the terminal between the helicopter and the most noise-sensitive building or area.

b. If the terminal is surrounded by noise-sensitive areas, approach at the steepest practical glide slope.

c. Avoid flying low near hospitals, nursing homes, schools, residential areas and other highly noise-sensitive facilities and areas.

d. If the terminal is in or near a noise-sensitive area, use the noise-abatement approach and landing technique described below and illustrated in figure 4.

Noise-Abatement Approach and Landing

1. When commencing approach, begin descent at least 200 fpm *before* reducing air speed, then reduce air speed while increasing rate of descent to about 800 fpm.

2. At a convenient air speed between 50 and 80 knots, set up approach glide slope while maintaining the 800 fpm rate of descent.

3. Increase rate of descent if the main rotor tends to slap, or if a steeper glide slope is desired.

4. Approaching the flare, reduce air speed to below 50 knots before decreasing rate of descent.

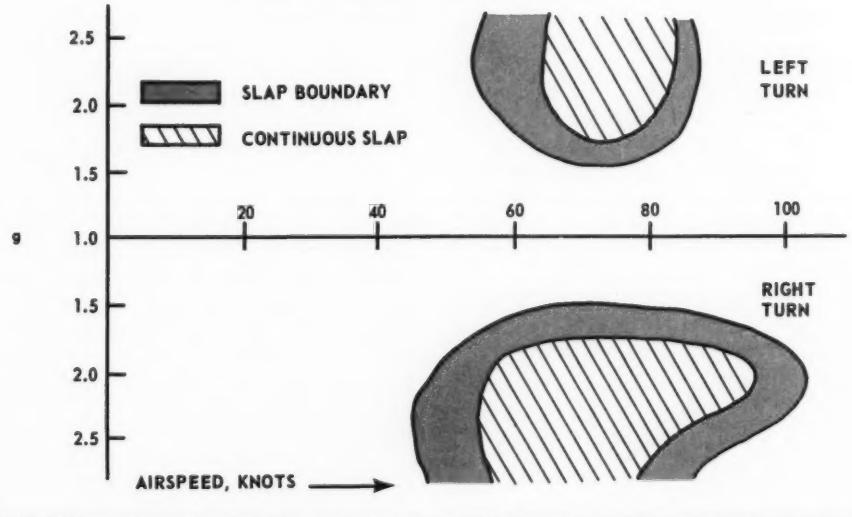
5. Execute normal flare and landing, decreasing rate of descent and air speed appropriately.

[*Editor's note: This procedure is applicable for VFR use only and should not be used under IFR conditions due to the required high rate of descent. Extra caution must be exercised when using this procedure with loaded aircraft. Additional engine power will be required during termination due to the reduced forward air speed which is normally used in the flare to stop the rate of descent.*]

The basic difference between this quieter approach technique and normal operation is that the pilot begins his descent before reducing air speed. Both procedures give approximately the same air speed

FIGURE 3

NOISY MANEUVERS – MEDIUM HELICOPTERS



during the approach, with the quieter technique using a glide slope which is a few degrees steeper. Once the pilot has transitioned from cruise to the approach glide slope, he can tailor his air speed and rate of descent to fit local conditions, avoid unsafe regimes and still guarantee minimum noise. This noise-abatement flight technique reduces the ground area exposed to a given noise level by as much as 80 percent. Figure 5 shows this for a conventional straight-in approach.

Departure

Takeoffs are reasonably quiet operations, but you can limit the total ground area exposed to helicopter sound by using a high rate of climb and making a very smooth transition to forward flight. Your departure route should take you over areas which are least sensitive to noise.

Maneuvers

Avoid rapid, high g turns, as a general rule. When the flight operation requires turns, perform them smoothly. Be smooth in all other maneuvers, also.

METEOROLOGICAL CONSIDERATIONS

Although the pilot cannot control the weather, he may be able to adapt his flight schedule to take advantage of meteorological conditions which can help him to minimize noise. The two weather factors which are most useful in this respect are wind and temperature. They are helpful because they vary throughout the day (diurnally) in a more-or-less predictable manner, and affect the propagation of sound.

Wind has two effects on sound. It carries it in the direction toward which it is blowing, and it makes a background noise of its own which, in high winds, tends to reduce the annoyance factor of the sound of a helicopter. In inland areas, surface winds generally are stronger during the daytime (maximum in midafternoon) and weaker at night. In coastal regions, land and sea breezes (caused by the tendency of land to heat and cool more rapidly than water) give a different diurnal pattern, beginning to blow shortly after sunrise (sea breeze) and sunset (land breeze). You can use these winds to increase the acceptability of your helicopter by flying downwind of densely populated areas and by scheduling after noon the majority of flights near especially noise-sensitive areas.

Temperature likewise has two effects upon sound. One is the tendency of warm air to be more turbulent than cold air and to disperse sound with more loss in intensity (even though the sound wave actually travels somewhat faster in warm air than in cold).

FIGURE 4

NOISE-ABATEMENT FLIGHT TECHNIQUE – MEDIUM HELICOPTER

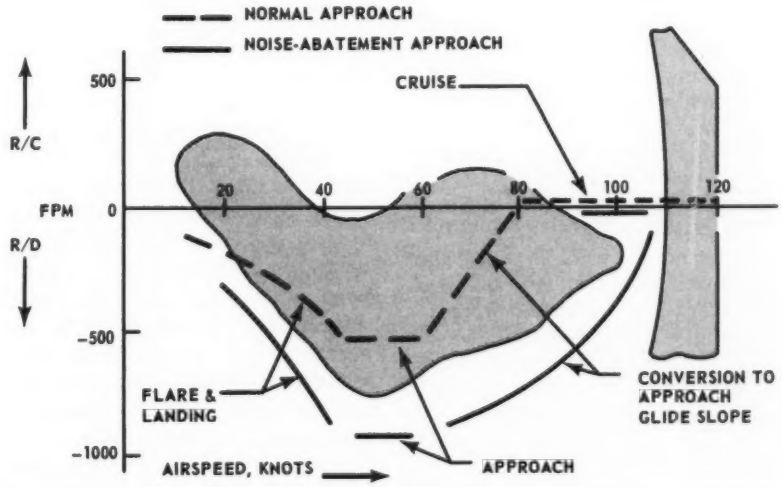
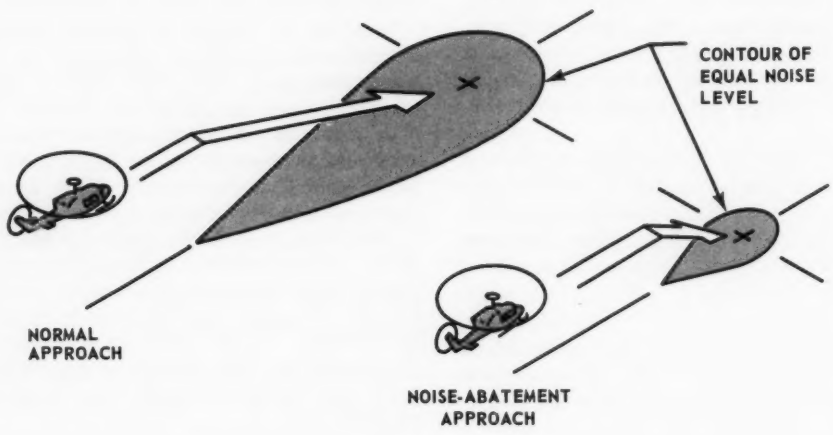


FIGURE 5

GROUND NOISE – EXPOSURE FOOTPRINT



The major effect of temperature depends upon the temperature gradient—the change in temperature with altitude. The normal gradient is negative—temperature decreasing with altitude. Because sound travels faster in warmer air, in atmosphere with the normal gradient the lower part of a sound wave tends to outrun the upper part, making the propagation, in effect, curve upward and away from the populace. This negative gradient reaches a maximum in the late morning or just after noon, and increases in magnitude during summer months more so than on wintry days. This means that it is of some value to schedule flights to and from noise-sensitive areas during the warmer parts of the day.

At certain times, however, there may be an inversion in the atmosphere—a layer of air from a few hundred to a few thousand feet thick in which the temperature increases with altitude. The inversion reverses the normal "curvature" of sound propagation, turning an abnormally high portion of the sound energy back toward the ground. The most severe inversions usually occur at night and in the early morning. These, then, are the times when the sound of the helicopter will have the most adverse effect upon people on the ground.

A third meteorological item that affects the propagation of sound is humidity. But its direct effect is of little importance (it attenuates high frequency portions of the sound spectrum). As visible moisture, it is important as an indicator, in that on overcast days of fog, drizzle or light snow, temperature and wind gradients are generally small, resulting in increased sound propagation. Of all the many combinations of atmospheric conditions, that which does least to reduce the sound of a passing helicopter is the combination of no wind and an overcast on a cold morning. It is most important that at these times you use the noise-abatement flight techniques.

Although environment is hardly a meteorological subject, it might be well to mention here that the ground environment has much to do with the offensiveness or lack of offensiveness of the sound you make. The background noise level or sound environment of residential areas reaches its lowest point between late evening and early morning. In warm weather, people are apt to be relaxing out-of-doors in the evening and on weekends. It is at these times that the citizen is most conscious and resentful of noise intrusion, and therefore at these times that you should be most reluctant to fly noisily near residential areas.

If you have a question concerning aviation accident prevention, write to Commander, USAAAVS ATTN: Orval Right Fort Rucker, AL 36360

Safety Publications

All along we have many queries about available safety publications. In addition to *Flightfax* and *Maintenance Fax,* which are weekly and monthly mishap summaries, the following publications are currently available from USAAAVS, ATTN: FDAR-EP, Fort Rucker, AL 36360:

Guide to Aviation Resources Management for Aircraft Mishap Prevention, Third Edition—Prepared for commanders, staff officers and leaders of the varied activities in Army aviation. As its name implies, it serves as a guide for preventing aircraft mishaps through the judicious and skillful use of aviation resources.

Sample Aviation Accident Prevention Program—Prepared for aviation unit commanders and safety supervisors to implement effective accident prevention programs. Developed from aviation accident prevention programs submitted by Army units.

Flight Surgeon's Newsletter—Published quarterly for flight surgeons and other personnel interested in aviation safety, human factors, life support equipment and aviation medicine.

System Safety Newsletter—Published quarterly for the exchange of newsworthy items in the field of system safety as it applies to Army aviation.

Technical Report 71–1, *Army Midair Collisions*—An analysis of 56 Army midair collisions that occurred from January 1963 through November 1969.

Technical Report 71–2, *Wire Strike Report*—Study of factors and circumstances causing or contributing to Army aircraft wire strikes.

Technical Report 72–2, *Aviation Safety in Combat*—An analysis of the opinions of Army aviation unit commanders in RVN concerning critical aviation safety issues that arose in response to demands of the RVN conflict.

Technical Report 72–4, *Aviators With Two or More Pilot-Error Accidents*—A study of personal characteristics of aviators who had two or more pilot-error accidents in a 30-month period.

Technical Report 72–6, *Crashworthy Fuel System Mishap Data*—An analysis of mishaps involving aircraft equipped with crashworthy fuel cells, 1 June 1970 through 31 August 1971.

Ten Points for Command Attention—Ten accident-prevention "do's" and "don'ts" for commanders/supervisors, drawn from analyses of pilot-error accidents.

Inability to Fly Basic Instruments—Analysis of accidents involving pilots not proficient in instrument flight, IMC being a cause factor in the accidents.

Improving Initial Distribution of Aviation Publications—Designed to assist units in obtaining aviation publications and containing "how to" details (reprint from *Flightfax*).

Mishap Experience Reports for the following aircraft (statistics, analyses and selected mishap briefs for a given period): CH–54, June 1973: AH–1G, January 1973; OH–58, November 1972; OV–1, October 1972.

To obtain distribution of the U. S. ARMY AVIATION DIGEST and DA aviation safety posters, submit DA Form 12–4 in accordance with instructions on the form (see AR 310–2).

Continued from page 7
saved my life initially. I then unbuckled myself, but again with some difficulty, because of the burns to my right hand, and finally got out of the aircraft.

As I staggered away from the aircraft, I remembered the gunner. Our policy was to do everything possible to bring back everyone. So I returned without my helmet to the aircraft which was lying on its side and again saw the flames but didn't feel them because I was in a state of shock. The rounds on the decking began to cook off and I realized that the M60 was pointed at me. In fact, I thought I was going to get shot with my own machinegun. I was having difficulty seeing because part of my face was badly burned and I was also slow to think. I couldn't find the gunner, so I staggered away from the aircraft, assuming that he had been thrown free.

My cover bird, a Huey, and several Cobras were passing over, but I had no way of signaling except with an OD left hand. At the time of the accident, I was wearing a Vietnamese western style holster. I had my .38, survival gear, pen flare, strobe light and survival knife all on this thin piece of leather holster belt which had been burned off my body, and my AR 15 was still in the aircraft.

As I became more alert, I started evaluating my situation and realized that I had crashed on a mountain, but couldn't remember why. The cover aircraft could not rescue me because I had occupied the instant LZ with a burning aircraft. I knew that if I went down the mountain I would get deeper into triple canopy jungle, whereas, if I went up the mountain, I would go through the fresh earthen works which possibly meant running into the enemy. But I chose to go up the mountain and take my chances on being rescued. While going up the mountain, I could see the Hueys flying over the treetops and was concerned that they might shoot me since they had no means of knowing I was alive. On reaching the mountaintop, I found a bomb crater where I was picked up about an hour and a half after the accident.

I was evacuated to the 85th Evacuation Hospital in Phu Bai where I remained for a couple of days and then was evacuated to Camp Zama, Japan, for 2 weeks. I was not expected to survive because I had sustained third-degree burns to 35 percent of my body. My head, face, back of the neck, right shoulder and right arm and hand were burned and, because of my extended time on the ground, I had also contacted a bad jungle infection. From here I was medevaced to Brooke General Hospital to the Institute of Surgical Research, where the physician Major Tom Newsome and the burn ward staff started working on me and saved my life. For 3 months I was unconscious and for 5 months I was blind due to burn damage to my eyelids. My life and eyesight were saved because of the protection of the helmet and visor. I dropped from 190 to 127 pounds, and had renal failure [failure of kidneys to function because of severe dehydration, acute toxicity or the accumulation of debris which blocks the renal tubules] twice, while at the same time my body was fighting a severe infection. I attribute my survival to the combined efforts of the remarkable personnel at the Institute of Surgical Research; to my good physical shape, which advocates that we need to keep in tip-top condition; and especially to my protective clothing and equipment. When the accident occurred, I was wearing complete Nomex with sleeves down and gloves on. I had my helmet on with the clear corrective lenses and visor down.

When I regained consciousness, I was moved out of the intensive care unit to the skin grafting ward. Skin grafting is a very long, uncomfortable and drawn out process; it's not like Mission Impossible where you're healed overnight or within 6 weeks. Initially, they debride all the wounds and then cover them with sterilized pig- or hogskin. I kiddingly say that if you complain about your Army occupation you haven't had a bad job until you're a pig working for the Institute of Surgical Research, because half your body is skinned once every 6 months. The pigskin is processed and used for sterile dressings on the exposed areas to prevent water evaporation, which causes renal failure, electrolyte imbalance [loss of vital mineral substances in the body or an overabundance of certain minerals] and cardiac and respiratory problems. The pigskin is debrided each day in the Hubbard water tank and fresh pigskin is applied. The burned area is debrided to bring

the blood to the surface and rejuvenate the remaining cells so that they will start to grow and replenish. After this process, the body begins to reject the pigskin and then cadaver skin is used for sterile dressings. It didn't bother me to have the cadaver skin on my body, but it did bother me when I awoke one morning and found a red heart-shaped Navy tattoo on my arm that said "Mother," with anchor and all! I was afraid it would take, but, fortunately, my body rejected it as it was supposed to. After this procedure the body is ready to accept skin grafts. Almost two-thirds of my body was skinned to cover the one-third that was burned. Fortunately, Doctor Newson and his staff saved my right arm which by all standards should have been amputated.

". . . one of the main things I have noticed is the many mistakes being made by Army aviators in not fully using ALL the safety gear that's available to them."

From this ward, I moved to the plastic surgery ward. Through Colonel Peterson's skill, my nose which had been burned off flush with my face was rebuilt. Then he transplanted my eyebrows from remaining scalp taken from the top of my head and rebuilt my upper lip and chin in conjunction with numerous contraction releases. This plastic surgery took approximately 20-21 months.

I was then assigned to Operations of the 507th and started working for short periods of time each day. My first mission with the 507th was to serve on an accident investigation board to map out a disintegrated UH-1 in which two men burned to death. While I was at the 507th, the minor and major plastic surgery was continued. It was at this time I developed my safety program in conjunction with the full support of Colonel B. Pruitt, director and commander of the Institute of Surgical Research, and his outstanding staff. After this surgery was completed, I took my in-flight examination and passed except for my dislocated right thumb. After Colonel Peterson did more hand surgery, I again took the in-flight examination, passed and was returned to full flight status on 1 July 1973, 2½ years after the accident. This brings me up to date as I marry up with the USAAAVS team to present safety classes on life support systems.

McCULLAR: The other day during our conversation you described several interesting cases you observed in the burn ward during your approximate 2-year stay. Would you care to describe some of these for us ?

NOWLIN: I think that one of the main things I witnessed was the many mistakes being made by Army aviators in not fully using *all* safety gear available to them. We were very fortunate in that those of us who were in the ward during 1971 all related to one specific area—Vietnam. The Red Cross workers and social workers thought our group had one of the best attitudes in the hospital because we joked and kidded with one another. We commonly referred to ourselves as members of the Krispy Kritter Klub. To become a member, you have to have 10 percent burns or better and we jokingly say the membership is "just pure hell."

The majority of us were Army aviators and crewmembers because we were flying a large number of missions at low altitudes which involved greater danger. During my confinement, many things occurred that were very obvious to us, but that the 100 percent A-1 Army aviator never encounters. In fact I have found that aviators who have been burned now practice things on their own that most aviators overlook, such as flipping up their collars before each flight. Many of my friends received some burns that could have been prevented if they had fully used the equipment that was available to them. For instance, the initial international orange flight suit was fine, but the Nomex that we have today is much better, if correctly worn. We found that the cool guy —the one who flew with his sleeves rolled up and gloves off—was taking a great chance. Many aviators lost their fingers and the use of their hands from fires that were not very serious, but their injuries were terrific. The basic problem to Army aviation is the flash fire. The flight suit is designed to protect against this flash, but we must understand that we cannot remain but for a short duration in a fire. The temperature of the fire and its duration determine whether a person will survive and how bad his burns

will be. Many hands are crippled because aviators fail to wear their gloves properly, that is, they wear them partly rolled down, and the end results are pathetic. For ultimate protection, Nomex gloves should be worn with gauntlets extended under snugly fastened sleeve cuffs.

When the hands are burned, the fingers generally shrink or the fingertips have to be amputated due to poor circulation in this area. This causes the hands to be permanently shaped like a claw (see photo 1). The hands of a man who was in a very light flash fire are shown in photo 2. Note the unburned area on his wrist where he was wearing his watch. Yet he sustained very painful burns to the backs of his hands. Although his hands will heal, they will never be the same again. They will be more sensitive to cold and heat and even after they heal they will be very tender and easily skinned and very susceptible to infections.

". . . the cool guy—the one who flies with his sleeves rolled up and gloves off—is taking a great chance"

Photo 3 illustrates what can happen when the body is improperly protected. For reasons unknown, this aviator had his left glove off and his sleeve rolled up during the accident. His entire body was subjected to the same amount of heat for the same amount of time in the flash fire. However, he sustained deep third-degree burns to his left hand; whereas, his right hand had very minor blotchy second-degree burns. The rest of his body was not burned because he was properly wearing the rest of his Nomex clothing. I have seen numerous individuals who were wearing Nomex and received light-to-moderate second-degree burns. They owe their lives to the protection of the Nomex. But I want to emphasize that Nomex offers the best protection when it has an air layer between the Nomex and the skin to diffuse the heat. If the Nomex fits too closely to an area of the body, this area will burn because the heat is transferred directly through the Nomex to the skin. The ultimate flight suit will have to be light and offer extended fire protection, comfort and dexterity of movement. Aviators must have this built-in comfort or they will not be able to fly day in and day out. To date, Nomex is the lightest weight material and provides the best protection. It is a synthetic, but it was specially designed for fire protection by the Aeromedical Research Laboratory under Colonel Robert Bailey, Fort Rucker, AL. Work progresses today on the Nomex II, an improvement to today's flight suit, and it will be available in the future.

I would like to mention that *if you're going to fly, for heaven's sake do not wear underwear made of polyester, nylon, rayon, dacron, etc.* There's a case on record in which a lieutenant was flying in a Huey with two of his friends. He was strapped in the back seat and they were performing unauthorized maneuvers. They mushed the aircraft in and the two crewmembers in the front seat were fatally injured and the lieutenant was thrown clear of the aircraft, but was engulfed in a flash fire. When he was rescued, he didn't appear to be too badly injured. As a matter of fact his Nomex was only barely scorched and a package of cigarettes in his pocket was not even scorched. However, his entire body was saturated with synthetic burns because he was wearing long johns which contained synthetic material. He lived 7 days after the accident and related the flight. This proves the point that cotton or wool works best for underclothes because a cotton or wool fiber is the opposite of Nomex in that either offers the greatest protection when worn close to the body.

Speaking of Nomex, when I was in the hospital, I noticed my knee and remembered a tear in the Nomex was right on the knee. It was a deep third-degree burn about one-half or three-quarters of an inch in diameter, surrounded by second-degree burns, and then no burns. This alone proved to me that the Nomex offers excellent protection against flash third-degree burns. Except for this area, a burn on the back of my left leg where the Nomex fit too closely because I had my trousers tucked inside my boots, and that area where I was hanging in the fire for a long duration, Nomex did its job.

Another area I remember that was very uncomfortable was the burn across the back of my neck. One day last summer, one of my aviators came in operations with his collar turned up. I jokingly

"It is the commander's responsibility to ensure that his men use the protective clothing and equipment"

asked, "What's your collar up for?" He looked at me rather quizzically and replied, "You're asking me why my collar is up?" Then, I remembered the back of my neck after the burns. I had never thought of wearing my collar up nor had I noticed anyone else flying with theirs up before. With the aid of Mr. Lee Newman at the Institute, records were researched for photographs that showed the effects of failure to fly with the collar up. Photo 4 shows an aviator who made two mistakes—his collar wasn't up and his helmet was ill-fitted. He sustained deep third-degree burns across the back of his neck in only a flash fire and during the accident his helmet was blown off and he sustained second-degree burns to the back of his head. The protection that the collar offers when it's turned up is free. It's just a matter of slipping that collar up and keeping it up even if you don't fasten the tab. Also, aviators should ensure that their helmets are properly fitted by the flight surgeon.

Photo 5 shows a man whose helmet was properly fitted, which saved his hair, scalp, ears, etc. However, he did not have his collar up. He sustained very deep third-degree burns to his neck which required grafting. Consequently, he was confined to the hospital for several months.

Photo 1. The fingers of badly burned hands generally shrink, leaving the hand in a permanent claw-like configuration

Other patients I noticed in the burn ward had burns only on their facial area. It looked as if they were wearing a mask because they failed to wear their visor down and their collar up. During the accidents, the SPH-4 helmet, which is probably one of the finest headgears in the world of aviation today, protected their head, ears, eyebrows and the sides of their faces. But had their visor been down and their collar up, much less plastic surgery would have been required, especially to the delicate eye region. It's true that the visor will melt, but by the same token if you're exposed to fire long enough for the visor to melt, you'll have very serious injuries and more than likely will not survive. For adequate protection, the helmet must fit properly, the chin strap must be snugly fastened with *no* chin pad, and the visor must be down. It is now a policy of the 507th that when an aviator is assigned to the unit and reports for his physical clearance, he must have his helmet fitted by Doctor Schlesinger, our flight surgeon. This may be a good practice for other units to initiate.

I also reviewed a case in which an Air Force colonel who was wearing Nomex died from third-degree burns. His legs were badly burned, but his feet were unmarred due to the protection of the leather. However, his ankles looked as if they had been chopped with an axe (photo 6). He was wearing zippers in his boots and the zippers

have synthetic material around them. If the fire had been less intense, the Nomex would have protected this aviator from deep burns, but he still would have required tendon transplants to replace the destroyed ankle tendons. The transplants would have involved at least 3 to 6 months in the hospital and the aviator would have had a permanent limp if he ever walked again.

McCULLAR: You said previously that we are trying to appeal to the individual aviator to wear his protective clothing and equipment and wear it properly. After all it's his life. But don't you think commanders should always insist on it?

NOWLIN: Yes. It is the commander's responsibility to ensure that his men use the protective clothing and equipment. However, I think the commander has so many responsibilities—everything from the Dempster Dumpster getting unloaded to writing a letter to the surviving wife—that he sometimes overlooks this area and more or less leaves personal safety to the individual.

McCULLAR: I don't mean to completely take the responsibility off the back of the individual aviator, but at the same time I do not want to relieve the commander of his responsibility to insist that the regulations, rules or do's and don'ts on personal equipment are followed.

NOWLIN: Yes, sir, you're absolutely right. Anyone who visits the burn ward will be impressed with the fact that each individual's injuries are very personal. It's happened to them and they're going to live with the scars the rest of their lives. It's not something that just happens and you're healed. It's for keeps.

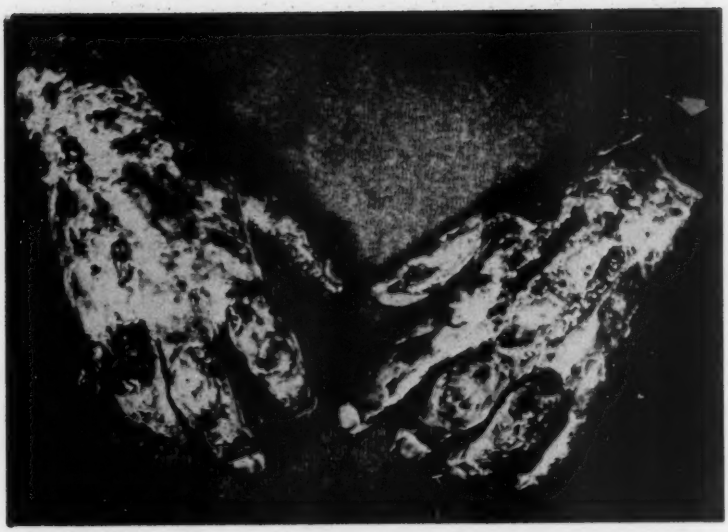


Photo 2. Pilot, not wearing gloves, was exposed to light flash fire. Note unburned area on wrist protected by watch

This particular point has been brought home in my unit. I more or less use my unit as a guinea pig, so I asked my CO, Major Ellingson, about marking our helmets for reflective purposes. Being a STRAF unit, I had to use a temporary marking, which could be easily removed in case of a combat situation. For daylight operations, I marked the helmets with a yellow-orange dayglo tape. For nighttime operations, I used a silver-white reflective tape, such as that used around fire extinguishers for nighttime identification. I found that the tape had the best reflective quality when cut into half-inch strips and centered on 2-inch yellow-orange dayglo tape. Our unit performs many night MAST missions, and the white tape lets the aviator know where his crew chief and medic are on the ground at all times. Initially, I marked all crewmembers' helmets with the silver-white reflective and yellow-orange dayglo and the pilot's helmets with only dayglo, in accordance with TM 10-8415-206-13. When I asked Major Ellingson what he thought of this, he told me to mark all helmets with both tapes for day and night identification. He also related that he had another use for the tape. He could look out on the flight line from his office window and see whether the crewmembers had their helmets on when the aircraft was

Photo 3. For reasons unknown, this aviator was flying with his left glove off and sleeve rolled up. He sustained third-degree burns to his left hand, but his right hand had very minor burns

being cranked, as required by the checklist, sort of a commander's "doublecheck." Not only will the tape aid in locating downed crewmembers during daylight or night operations, but also aids the commander in keeping a check on his people.

This brings up another subject. If you are unable to get any type of survival equipment, use makeshift items until you can. It only takes about 5 minutes to obtain a flashlight and drop it in your flight bag. Also, any "left-over" items from Vietnam should be put to use rather than letting them lay around and collect dust. I've carried a strobe light, pen flares and survival knife in my bag for over a year and haven't even noticed the few ounces of extra weight. Granted, I'd much rather have had a survival vest but it wasn't available until now. It's just a matter of finding a substitute, using it and sharing your information with others.

I noticed some officers who were carrying leather pouches on their belts in which they carried pocket knives. The pouch is small, worn on the outside of the belt and not bulky. It's always on your person and easily accessible if needed. A pouch can be made in 15 minutes in a handicraft shop for 90 cents. In fact, I now use one of these in my presentations and when I'm flying. The Army has many knives which can be obtained through the system and the aviator can choose the one best suited for his particular mission (overwater, general, snapblade, etc.).

The Army has a waterproof, lightweight combat casualty blanket, FSN 7210-935-6667, which is fluorescent orange on one side and silver on the other and is known as a space blanket. Not only is it good for covering the injured but is also a good signaling device. The blanket weighs only a few ounces and requires little storage space (3″x4″x2″) in the flight bag, yet it can cover an area 6½ feet long by 4 feet wide.

Another interesting day and night signaling device I noticed being used by one CW3 was a ladies' powder compact, which is very lightweight. He removed the powder from the compact so that he could carry a book of waterproof matches on the inside for nighttime signaling and the mirror for daytime signaling. Some may think this idea is comical, but it is actually ingenious.

One aviator in our unit wore a survival knife on the outside of his Nomex and some of the guys kidded him about it. Many ideas such as this get stifled because of this exact reason. However, I believe an idea such as this should never be discouraged unless it is dangerous. Taking advantage of any survival gear is a sign of professionalism and personal choice. Just remember, Orville and Wilbur Wright had enough confidence to drive on even though they were being ridiculed. So don't discard a good safety habit just because someone else wants to live dangerously.

McCULLAR: Not all the patients on the burn ward are military. I believe they accept badly burned civilian patients. Could you describe some of them for us?

NOWLIN: Yes, sir. The ward has now changed from 90 percent military to 90 percent civilian patients and the lessons learned because of military personnel and war injuries are saving many civilians today. The primary military contributor was the Army aviator. This is attributed to the zero flash point of the JP4 fuel. Although JP4 is inexpensive and very good jet fuel, it is very dangerous. Because of the number of military personnel who passed through the ward, the ward began to grow and the process of treating burns is now an exacting science with set procedures as lifesaving steps. The Institute now has the space available to adequately treat the burn patients. The people in the ward

today are there because of their mistakes, such as refueling hot lawnmowers, storing or using gasoline inside the garage or other dangerous areas, wearing nylon nighties when cooking, etc. Children are probably the saddest cases. Their burns are usually caused from gasoline, scalding water or coffee, chewing on the ends of extension cords, playing with cigarette lighters, wearing synthetic clothing, and dangerous electrical sockets.

During the summer months there are many patients whose burns are caused by refueling hot lawnmowers. People just don't take time to let the engines cool before refueling their mowers. Also, many do not have the proper kind of gas cans in which gasoline can be safely transferred so that it will not splash over onto the hot manifold, ignite and explode. Any amount of gasoline can be deadly, especially when you're close to it. Gasoline is a necessary evil in our modern society, so when storing gas in the garage, be sure that the can is placed at least 7 feet above the floor, warn your children of its danger and keep it from the open flame of the hot H_2O heater.

Hot water heaters are installed in approximately 60 percent of the garages today and the danger here is that small blue flame. Many times gasoline vapors ignite with the flame as the gasoline vapors flow over the floor, seeking the lowest level. And those who insist on cleaning any item inside the garage with gasoline are asking for trouble. Again, the gas vapors find their way to the blue flame, causing an explosion.

One accident with gasoline burned six people who qualified for the Krispy Kritter Klub. A man was cleaning his car engine with gasoline and he told one of the others to crank it. The car backfired and the gasoline exploded. This accident was a result of just sheer inattention.

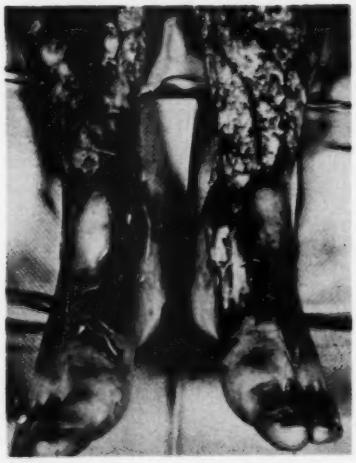
Motorcyclists have a very definite problem because the gasoline tank is located between their legs directly above the manifold and exhaust system which are extremely hot. Also, care must be taken during fueling to avoid spilling the gas on these systems. And it's a proven fact that other motorists many times fail to see the motorcycles. One case I witnessed in the ward was caused by a motorist pulling out from an intersection and striking a motorcyclist even

Photo 4. Pilot's improperly fitted helmet came off during crash and he sustained second-degree burns to the back of his head. Deep third-degree burns to the back of his neck could have been prevented had he worn his collar turned up

Photo 5. Properly fitted helmet saved this pilot's hair, scalp and ears, but he did not have his collar up and sustained third-degree burns to his neck

though he had the right of way. He hit the side of the car, flipped upside down on the front of the car and was saturated with gasoline, burning over 85 percent of his body. Skin had to be taken from the remaining 15 percent of his body six times in order to cover the burned areas. This is just one of the numerous motorcycle cases that are handled on the burn ward. A person's chances of being injured on a motorcycle are 13 times greater than on a 4-wheel vehicle. So, if you're going to ride one, I suggest you turn on the light, wear international orange or bright colored reflective clothing and mark the helmet with orange colors or something similar. The professional motorcyclist invests from 250 to about 400 dollars in leather boots, leather pants, leather shirts with chicken plate, protective helmet and leather gloves. He realizes the chances he is taking even when properly dressed. In fact, many professionals confine their driving to dirt tracks only, as they realize the great danger of driving on the open road.

Photo 6. Feet were protected by leather boots, but synthetic material around zippers in boots caused third-degree burns to ankles



McCULLAR: During your safety presentations to aviators, have you found any detectable trends and attitudes?

NOWLIN: Presently, my travels have not been extensive enough to adequately comment on a great number of trends or attitudes. However, I have met and talked with several professional aviators who were extremely safety conscious. For instance, one pro, CW3 Pettit at Fort Bliss, TX, carried survival gear you wouldn't believe. He is a 20-year man who had spent considerable time on the ground with the special forces in Vietnam and realized the importance of survival equipment. On the other hand, the newer aviators don't seem overly enthusiastic one way or another. One trend I have noticed is the wearing of the synthetic neck scarf which does improve the appearance of the uniform and emphasizes esprit de corps. But I would like to point out that the scarf should not be worn when flying if it is synthetic. In a flash fire it will melt into the neck, causing serious synthetic burns.

McCULLAR: You've seen the experimental combination survival and armor vest. Would you care to comment on it?

NOWLIN: It appears to be a very good piece of equipment; however, it is presently very bulky and heavy. But this Nomex vest and the chicken plate do offer greater protection than the nylon vest. I am confident though that a lighter, cooler and more comfortable version will be available sometime in the future.

McCULLAR: Captain Nowlin, are there any particular pointers you wish to give to those in the field on personal survival and rescue equipment?

NOWLIN: Yes, sir. A lot of time, effort and money has been spent on the personal survival equipment and protective clothing which are available in the supply system and it is a proven fact that it saves lives. If anyone does not have some of the items available in the Army inventory, they should requisition and use them properly. And I again want to stress the importance of sharing individual ideas and experiences. Anyone who has a good idea should not let it fall by the wayside. It takes very little time and effort to prepare a suggestion and submit it through appropriate channels. Also, if an individual has an idea for an improvised item or for another use of the equipment now in the system, he should and can share it with others by submitting it to PEARL, USAAAVS, Fort Rucker, AL 36360.

McCULLAR: Captain Nowlin, I want to thank you for your most interesting story and for your interest in personal safety. We at USAAAVS hope that those in the field will follow through on your professional advice. Give my thanks to Major Mayo Ellingson and those of the 507th Medical Company (Air Ambulance) who are making it possible for your safety presentations on life support equipment and for the film which will be available in the near future.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses
A More Useful FLIP

SICK OF TOTING those pounds of FLIP books up and down the ramp? Need an extra knee for a book to fall off of just as you need it? Tired of being a combination research librarian and pilot?

The preceding are a few of the many field complaints the USAASO, along with other service representatives, addressed at a recent FLIP product review. No, we are not going to issue another M46A1 knee, but in the near future, with your help, you may find room in the FLIP case for another pair of socks (or something).

Actions taken at this review fall into two categories: First, improve the existing product based on known deficiencies; and second, furnish the user with new concepts for his evaluation which then may evolve into a whole new product.

An example of the first category would be moving all reasonably stable information into volume I of planning. This would include flight plans (175, 1801, civilian) and related pilot procedures, ICAO General, and many special notices. Special foreign and bordercrossing procedures would be placed in the products relative to need, direction of flight, or returned to the Foreign Clearance Guide. This effort will lighten the pilot's load as well as create a more useful base planning and training document. Significant savings will result from changing stable information from a 56-day reprint cycle to 6 months or more. Between the IAP book, L&H enroute charts and supplements, a vast number of redundancies may be eliminated such as the multiple listing of flight service stations, VOR, radio beacons, etc. The policing of the existing publications leads naturally into the second category of study.

There will be prototypes of new and hopefully more useful inflight and leave-behind documents which you, the user, will be asked to evaluate. As a starting point, the new FLIP should be suitable for use by the single pilot in the most complex single-section aircraft we (the Services) have. DOD guidance in this effort requires standardization between DOD and NOS products and a common product for all Services to use. Economy of size and volume as well as cost will be major considerations. As an example, some reduction in volume can be obtained by consolidating high and low procedures and consolidation of procedures with common information, minimums and courses. Another way may be by combining STARs and approaches. Military and joint use aerodromes may be placed in one set of IAPs for DOD users with all other civil procedures issued looseleaf on a selective basis for those who need them (primarily Army).

In the interest of providing a better product for all, and one in which our particular requirements are satisfied, you are encouraged to send in your ideas directly to USAASO—be they objective, parochial or whatever. Young aviators should not take for granted that the grey beards producing this stuff know best. One sometimes forgets that if a half-good (or half-bad) product is used long enough, it seems better than it is.

USAASO sez: Thinking-questioning-suggesting-communicating makes for a better product.

☆ U.S. Government Printing Office 1973—748-161/5

Guard Takes Care Of Its Own

Lieutenant Kenneth M. Steffen

Public Information Office
Missouri Army National Guard

When a Missouri Army National Guard Huey had a forced landing recently, the Kansas Army National Guard's 137th Aviation Company, Topeka, KS, provided the lifting power with one of its CH-54 Flying Cranes to lift the Huey from a farmer's pasture about 10 miles southeast of Ft. Leonard Wood, MO. The CH-54 lifted the Huey back to the Missouri Army National Guard's Jefferson City Flight Activity

A professional approach to personal safety is presented on page 6 in an interview with CPT Charles F. Nowlin, full-fledged member of the Krispy Kritter Klub

"JUST PURE HELL"